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HERBERT COUPER WILSON.

It is fitting that all readers of POPULAR ASTRONOMY should know the person who has been directing the progress of this magazine for so long a period. Some, especially the professional astronomers of America, have had personal and, in many instances, intimate acquaintance and association with him. Some, who are not astronomers professionally but, as amateurs, have attended the meetings of the American Astronomical Society from time to time, have seen him there and have had passing acquaintance with him. Others through the long series of years have had exchanges of letters with him and in this way have learned to know him, although they have never seen him. Still others, and doubtless by far the largest group, have read the magazine from month to month unaware of the thought and care given to the various issues on the part of the Editor.

The writer has had the opportunity of observing the work of the Editor for a long period of time. For seventeen years we have met almost daily in the office of Goodsell Observatory. During these years much of our work has been done jointly, Professor Wilson leading the way. Throughout this period, in editing the magazine as well as in all his other work, he has always maintained a scholarly attitude toward study, an unswerving loyalty to duty, an unfaltering firmness in friendship, a noble Christian spirit in all relationships.

One of his characteristics, the one which has endeared him to a host of friends throughout the world, is to remain in the background. Therefore, without his knowledge, we are presenting him here (as well as it can be done by the printed page) to the friends of POPULAR ASTRONOMY, both old and new.

We do this with the complete assurance that all these friends will join eagerly with the new management in heartiest congratulations to Professor Wilson upon his eminently successful work during the past thirty-four years, and in sincerest wishes and hopes for continued joy in his beloved science in the years to come.

C. H. GINGRICH.

It is always most difficult to estimate the influence of a widely circulated periodical, and especially so in the case of one dealing with

science. The seed often falls on quite unexpectedly fertile ground. There can be no doubt that POPULAR ASTRONOMY, with which Professor Wilson's name has been associated for so many years and to which he has given such devoted service, has filled an important place among the journals treating of our science, and has helped in many ways to bridge the gulf which exists between the mind of the layman and the language of the astronomer.

Professor Wilson has had a trying task, for it is notoriously difficult to find a scientist who can write of technical results in simple language. He has, however, been unusually successful in it and he has, in addition, provided a journal of great value to astronomers. One need only refer to such material as the data on variable stars and the abstracts of the communications presented at astronomical meetings to appreciate this most fully. In laying down his editorship I am sure that Professor Wilson can take with him the realization of valuable work most excellently done.

WALTER S. ADAMS.

Mount Wilson Observatory.

Compensation for all the thought and time and downright hard labor that Professor H. C. Wilson has spent upon the work of editing POPULAR ASTRONOMY during the past thirty-two years he must find chiefly in the consciousness and satisfaction that he has thereby served the science he loves. This compensation should be great, for great has been his service. To determine how great, it is only necessary to glance over the indexes to the volumes, and note the numerous papers presenting the results of original investigations, the systematic reports of the proceedings of the American Astronomical Society, and of the American Association of Variable Star Observers, and the ephemerides of various stars and of comets; and to remember that the journal is read by professional astronomers everywhere as well as by hundreds of amateurs.

But in addition to this obvious service, there is another that is by no means negligible, though it is as difficult to weigh and measure as it is to catalogue

> "That best portion of a good man's life,
> His little, nameless, unremembered acts of kindness and of love."

This is the inspiration that has come to many a reader, the broadening of his mental horizon; and, possibly, the little extra stimulus that has decided a student, here and there, to take up astronomy as a profession. If we could know the whole truth, we might easily find that this is by far the greater service.

In common with all his other friends, I wish Professor Wilson long years of health to enjoy his well-earned leisure.

R. G. AITKEN.

Lick Observatory.

I am glad of the opportunity to say a few words in appreciation of the faithful work of my friend Herbert C. Wilson, as editor of POPULAR ASTRONOMY.

It is thirty years since his name first appeared upon the cover as an editor. We can well understand the patient effort expended before an article appears in its final form; and the delicate situations arising when manuscripts include too much chaff with the wheat. Professor Wilson has held to a middle course between the use of fantastic articles which come so often to an editor's desk and those of a severely technical character.

Scientific research has completed only a part of its duty when it discovers facts and attempts to formulate theories consistent with them: the intelligent citizen is entitled to a popular interpretation of new discoveries and modern theories when soundly based. The universe must be brought into the households of thinking people. POPULAR ASTRONOMY, under Dr. Wilson's guidance, has attempted to serve this cause, and its success is his. We congratulate him for it.

Now that he is retiring from active editorial work, we hope that he will find still more time for writing than heretofore. May his sane counsel continue with those who carry on his task.

EDWIN B. FROST.

Yerkes Observatory.

It is with a feeling of regret that I read the announcement of Professor Wilson's retirement. Although he has engaged in important researches and in the training of students, his greatest contribution has been in POPULAR ASTRONOMY. It is difficult to express what the publication under his leadership has meant to us. There has always been the personal touch. Those of us who have met him, and enjoyed his friendship, recognize his genial spirit in his writing.

The standard of POPULAR ASTRONOMY he has maintained with nicety of adjustment. He kept it true to its name, never permitting it to soar high over the head of the amateur. It has told the facts in lucid and unmistakable language. Devoid of any suspicion of sensationalism, it has kept its readers abreast of current research, putting them in touch with the latest in astronomical thought. It has been and is an invaluable aid, not only in encouraging professional and amateur, but in quickening public and wide-spread interest in the study of the heavens. Our best wishes go with Professor Wilson in his well-earned relief from heavy responsibility, but we shall still welcome, all the more eagerly, any article which may result from his increased leisure.

EDWARD S. KING.

Harvard College Observatory.

The retirement of Dr. Wilson from the editorship of POPULAR ASTRONOMY after thirty years' service in this capacity, will remind all

astronomers of their great indebtedness to him. Under his editorship, this journal has become an important factor in the development of this science in this country. He has not only continued the tradition of popularizing the subject but has succeeded in helping to make the work of amateur astronomers more useful and therefore more attractive. But it is not only the amateur astronomer who has reason to be grateful to him. The professional astronomer likewise owes him much. Among the services of the latter class which we have most reason to recall is his coöperation with the American Astronomical Society by which the activities of that organization have been so promptly and effectively placed before the general astronomical public.

FRANK SCHLESINGER.

Yale University Observatory.

The American Astronomical Society is indebted to Professor Wilson for services during many years. It was in 1913 that the happy arrangement was concluded between the Society and POPULAR ASTRONOMY whereby that journal undertook to print the accounts of the meetings and the abstracts of papers, on terms quite favorable to the Society. The third volume of these publications is now approaching completion. The work has involved a considerable amount of correspondence between Professor Wilson and the secretary, and it was always evident that the editor of POPULAR ASTRONOMY was doing the best possible for the Society. The proof which came through was often returned with no corrections whatever, a tribute to his exacting care. It is with pleasant recollections that the secretary records the unusually satisfactory nature of these business relations.

The Society has shown in part its appreciation of this and other services to astronomy by holding a meeting at the Goodsell Observatory, and by the election of Professor Wilson to the Council. We hope that at many future meetings we may continue to be favored by his genial presence and sound judgment.

JOEL STEBBINS.

Washburn Observatory.

AROUND THE WORLD FOR THE SUMATRA ECLIPSE OF 1926.*

By HARLAN TRUE STETSON.

A total eclipse of the sun is a striking event under any circumstances. When such an event occurs in a remote corner of the globe, it makes perhaps a special appeal to the imaginative mind. Such an event was the total solar eclipse of January 14, 1926.

This eclipse promised to be of great interest astronomically because of its relatively long duration—between three and four minutes—and also because of the fact that the sun is now well on towards the coming maximum of the sunspot period. The days immediately preceding the event showed the sun well spotted and gave every promise of a phenomenal corona of extraordinary interest.

The track of totality took one to the heart of the East. Its trace led from Central Africa across the Indian Ocean, the Dutch East Indies and the Philippine Islands to the South Pacific Ocean.

To select a site for observation was one of the first considerations of astronomers. For serious work instruments must be erected with stable mountings. Observations could be made profitably therefore only from points on land. In Africa where the shadow of the moon first touched the earth, the sun would be low in the morning sky and not very favorably situated for observation. The shadow would reach the Philippines late in the afternoon when cloudy conditions would be most likely to prevail, and the sun seen well down towards the western horizon.

Eclipse at midday would occur in the middle of the Indian Ocean, but by two-thirty in the afternoon, while the sun was still high, the shadow would be crossing the island of Sumatra from Benkoelen to Palembang. Chiefly on Sumatra therefore were gathered the astronomers, American, English, Dutch, German and Australian, to gamble with nature where clouds are trumps. A single expedition observed from the East Coast of Africa.

The three American expeditions comprised one from Swarthmore College, one from the United States Naval Observatory, and one from Harvard University.

Associated with me in the party representing Harvard was Weld Arnold ('18), W. A. Spurr ('25) and Dr. W. W. Coblentz of the National Bureau of Standards who joined the party at San Francisco. Mr. Arnold, formerly assistant in Astronomy at Harvard and now instructor in the School of Surveying of the American Geographical Society, New York, had but just returned from an exploration expedition to the Amazon region in South America under Dr. Hamilton Rice

*Adapted from an address at the Bond Astronomical Club, April 12, 1926.

(Harvard '98). Mr. Spurr, a student, had just graduated from Harvard, concentrating in mathematics and astronomy. We were especially fortunate to have with us Dr. Coblentz who was with the Harvard party at Middletown in January, 1925, and whose long experience in radiation was especially valuable in the application of the thermo-pile to the measurement of coronal radiation.

In choosing sites and programs for eclipse work, coöperation with the work of other eclipse observers is most essential, so that there may be no unnecessary duplication of effort. Our party therefore attempted no direct photography of the corona as that was being well taken care of at Benkoelen by the Swarthmore expedition with several cameras devoted to that end. The Harvard expedition confined itself chiefly to the measurement of the intensity and distribution of coronal radiation through five lines of attack: (1) Measurement of total visual brightness of the coronal light by means of a Macbeth luminometer which reads light values directly in candle-meters in comparison with a standard incandescent lamp; (2) The photographic registration of the coronal light in blue and in yellow light on an absolute scale by means of a King coronal photometer, thus giving a direct comparison of the intensity of coronal radiation of the 1926 eclipse with that of 1925, and at the same time a determination of the color index for the 1926 eclipse; (3) The photography of the coronal light in ultra-violet radiation only by means of a quartz lens heavily silvered through which by careful tests no visual light could penetrate; (4) The attempted measurement of the heat or extreme infra-red radiation of the corona by means of a vacuum thermocouple attached to a twenty-inch reflecting telescope of short focal length.

Our instruments and apparatus left Boston on the Dollar Line steamer *President Harrison* billed directly to Palembang, Sumatra, via Panama, the Pacific, and Singapore. Our party travelled overland to San Francisco to join the *President Harrison* which cleared that port on November 7. The voyage across the Pacific was delightful. In just one week's time we raised the Hawaiian Islands spending a day in port at Honolulu. To our great surprise we found there Dr. R. G. Aitken, Associate Director of the Lick Observatory who had but just arrived to visit his son, and we had the pleasure of a delightful evening with both Dr. Aitken and his son on board the *President Harrison* till sailing time at 9 P. M.

Sailing from Honolulu to Kobe we had the very interesting experience of crossing the 180th meridian (International Date Line) which occurred shortly after midnight of Wednesday, November 18. Thursday, November 19, was destined not to be, and Friday morning therefore immediately followed. This extraordinary event did not pass without due recognition in which a birthday-less fellow-passenger featured in a new rôle.

A day in port at Kobe gave us a glimpse of Japan with a side trip to Kyoto. We can not but regret our inability to have visited the Observa-

tory there, and to have crossed into Pekin, a centre of early Chinese astronomy. However, time and tide wait for no man and the same moon makes the eclipses that makes the tides. We sailed next to Shanghai. The four days during which the *Harrison* lay in Shanghai gave real opportunity to see something both of the old and the new China. A visit to Shanghai College and a delightful evening's entertainment by the Shanghai Harvard Club at a real oriental eating house were two memorable occasions of our visit at Shanghai.

Our next stop gave us a glimpse of the beautiful island of Hong Kong with its famous peak towering above the sea-port city of Victoria. From Hong Kong we steered southeastward to the Philippine Islands where we were in United States territory again. Two days in Manila brought us an invitation to visit the Observatory there where Father Selga described most interestingly to us the astronomical, meteorological, seismological and magnetic work of that important scientific station.

Four days brought us to Singapore, the "cross-roads of the East." One day there gave us barely time to transship our goods to the Dutch steamer *Van Swoll* which took our expedition to Palembang, Sumatra.

At Palembang the Dutch officials were most gracious and made every provision for our needs and transportation to Benkoelen, the small town on the southwest coast which was our immediate objective and where the Swarthmore party was already stationed. Free transportation of both personnel and equipment by train and motor merits high appreciation of the courteous and generous way in which visiting astronomers were everywhere received on Dutch soil. Before leaving Palembang we motored to Telangbetotoe where was located the Dutch party under Dr. Van der Bilt. The forbidding skies of the approaching rainy season gave little encouragement here for good eclipse weather.

It was a fascinating trip to Benkoelen across some two hundred miles of Sumatran scenery, through densely grown jungle teeming with life and the luxurious vegetation of a truly tropical country.

Passing through Kepahiang, a small town of the hill country, we stopped just long enough to visit the camp of the Naval Observatory and were fortunate to find Drs. Littel and Peters from Washington, and Anderson from the Mount Wilson Observatory. Before night-fall we were in Benkoelen, where besides Professor Miller and the Swarthmore party and Dr. H. D. Curtis of Allegheny Observatory we met Colonel Stratton, Dr. Davidson and Mr. Barton of the British Camp, and Dr. Freundlich and his associates of the German expedition. With the arrival of additional observers the total number of astronomers and associates at Benkoelen was thirty-seven. A most pleasant part of our life there was the common table provided us by our Dutch hosts at the Oranje Hotel where two of the day's three meals were taken by all the observers. Lodgings with breakfast were provided in the several homes of the Dutch people where our sleeping quarters were distributed.

We had arrived at Benkoelen Sunday evening, December 20. Our

goods coming from Lahat by motor truck were delayed in transit at Moera Bliti. After an exchange of wires with Mr. Arnold who was standing by the instruments, they were again got underway and arrived at our camp on the afternoon of Christmas Day—a welcome Christmas present.

Native artisans had already been set to work constructing shelters for our apparatus. Although work progresses somewhat slowly in the East, in a few days time we had two shelters of bamboo and atap construction erected, the one for the photometric instruments being in the form of a lean-to to one of the standing buildings used by the Swarthmore expedition, and the other an independent shelter for the twenty-inch reflecting telescope and auxiliary apparatus. The roof of the latter building had to be so constructed as to be capable of being opened sufficiently for observation and closed at a moment's notice at the caprice of tropical weather.

Aside from some slight damage to parts of the mounting of the telescope which were repaired without difficulty, no injuries to the apparatus were sustained in transit. The mirror which had been freshly silvered and lacquered just before shipment was found to be somewhat yellow. With the removal of the laquer and reburnishing with the rouge pad carried for the purpose it was found in the pink of condition and the silvering outfit transported for resilvering if necessary was never unpacked. This experience would seem to show that silver mirrors once lacquered can be transported to remote regions amidst unfavorable climatic conditions and restored at pleasure by removal of the protecting coat of laquer by a solvent, in this case, amylacetate.

Work progressed satisfactorily and, for a week before the eclipse, rehearsals were held almost daily, both in daylight and in twilight to insure no confusion in manipulation on eclipse day.

The sky and weather were of course matters of considerable study and speculation. Careful records during the few weeks prior to the great event showed about 60 percent of the days to give clear sky at eclipse time, a rather better run of luck than we had been led to anticipate for a rainy season.

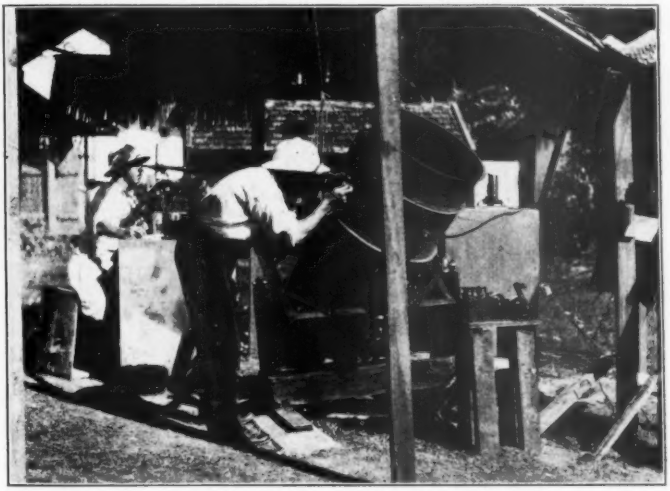
On January 14, the date of the eclipse, the day dawned clear following heavy rains in the early morning. Just to add to the excitement of the day, Mr. Arnold brought the cheerful news that Mr. Spurr had just succumbed to malaria, the worst enemy of the eclipse hunters in Sumatra. We were at best short handed, having six instruments to be read or tended by four people. The threatened loss of Mr. Spurr meant a serious curtailing of the photometric program, which seemed most undesirable.

The morning was spent in a consultation of doctors and the question of the full schedule being operated or not must wait upon the caprices of *Plasmodium malariae*.

By twelve o'clock noon threatening clouds had overcast the sky almost completely and a more disappointed, disconsolate group of scien-

tists than that at the table in the Oranje Hotel for an early lunch would be hard to imagine. But they were all good sports and could be good losers if lose they must in this contest of all games, a game of chance. One consolation for us was the removal of our anxiety as to whether or not our malarial patient could be operating at eclipse time.

At present, distracted with the first on-rush of the fever, he cared little—to lapse into a vulgarism—whether school kept or not, and as to whether the moon was this side of the sun or the other one. We could not have blamed him had he wished it on the other side so that the question of an eclipse should never have been involved. With advice that the sky was overcast the patient seemed relieved and passed into sleep.



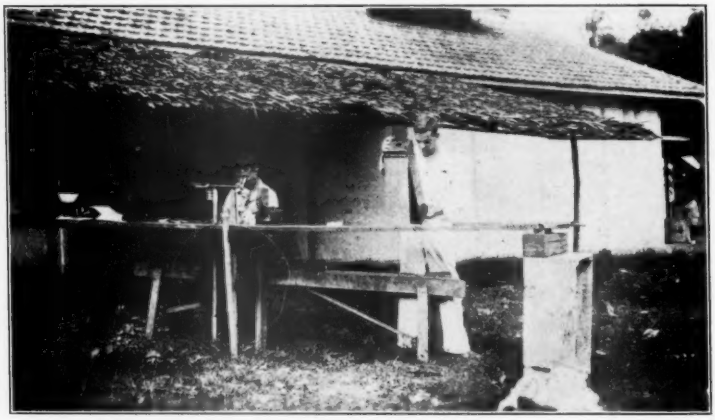
Twenty-inch Coronal Radiometer of the Harvard Eclipse Expedition to Sumatra.

However, by one o'clock the threatening clouds began to dissipate and by the time of first contact blue sky augered well for the crucial three minutes.

Our malarial patient was again consulted. Refreshed somewhat from an hour's sleep, and stimulated by a glimpse of the partial phase in a clearing sky, he determined he was out for "business as usual" and by aid of a quickly improvised stretcher, borne on the shoulders of four Malay convicts hastily coralled for the purpose, he arrived at eclipse camp twenty minutes before totality, operated the photographic photometer on schedule throughout every one of those precious 190 seconds and was pronounced by the rest of us the hero of the day.

Although the sky over our camp site was not perfect on account of thin clouds, we were to be congratulated on the sudden turn of luck.

While the atmospheric conditions owing to high humidity and thin cirrus cloud did not favor the transmission of the infra-red radiation which we had hoped to measure satisfactorily, there was little interference with direct photography. Exposures with the ultra-violet camera showed the distribution of the coronal light in short wavelengths, and the photometric plates which were immediately standardized have recorded satisfactorily the total brightness of the light emitted both in ordinary and in yellow light, the measurement of which when completed will give important comparisons with the results of the eclipse of 1925. The approach to the coming sunspot maximum makes the record of coronal intensity of succeeding eclipses especially desirable as well as the observation of its extent and shape. The direct visual observations with the luminometer not only has given us the ab-



The photometric bench containing luminometer and photographic photometer used in measuring the brightness of the corona of the eclipse of January 14, 1926.

solute measure of coronal brightness in terms of candle-meters but the form of light curve from which also the time of minimum can be spotted with an uncertainty of but a few seconds. A fuller report on the technical results of the expedition will be forthcoming at a later date wher the measurement of all the plates has been completed.

Four days after the eclipse found us leaving Benkoelen on the Dutch ship *Van der Hagen* for Java.

Leaving Sumatra astern we passed through the straits of Sunda where at dawn we looked upon Krakatoa, that remarkable volcano whose gigantic eruption in 1883 caused a monstrous tidal wave that washed a Dutch man-of-war a mile and a half inland into the jungle of Sumatra and left it stranded high and dry fifty feet above the highest high water known. Some perhaps will remember the gorgeously red sunsets of 1883-4 caused by the violent projection of dust and ashes

into the upper strata of the earth's atmosphere on this occasion, a cloud of dust so vast as to be carried by atmospheric currents over the entire globe and to be present for over a year's time.

Two days in Batavia gave us a glimpse of the beautiful island of Java from which we sailed for Singapore, where a wait of two days brought the Dollar Liner *President Polk* to take us homeward bound still westward. A brief stop at Penang gave us another glimpse of Malakan life. Thence we steamed to Colombo on the island of Ceylon, so delightfully described by Matthew Arnold in his "Light of Asia." Here we were rejoined by Mrs. Gertrude Arnold who was accompanying us on our world trip and who while we were busy with our eclipse work at Sumatra had penetrated for glimpses of India, north to Delhi to look upon its ancient observatory and to Agra to see the Taj Mahal whose dome, though housing no telescope, represents the highest achievements of architectural beauty.

The trip from Singapore to Suez was delightful with smooth water and sunny skies all the way. Night after night we watched the sun set below the western horizon over the vessel's bow and felt something of its lure which has always led man westward. Often with cloudless skies we watched the sun to the water's rim where with the disappearance of the last trace of its disk we caught the so-called "green flash" due to the lingering of the shorter waves of light through atmospheric dispersion. The charm of the day blended to that of night as the short twilight gave way to the star strewn skies whose radiance, enriched by the bright configurations of southern constellations, I have never seen surpassed. Long after sunset the zodiacal light streamed upward till its light was lost in that of the Milky Way, and late into the night we watched the gegenschein in the sickle of Leo.

The demand for astronomy on ship board brought forth lectures on eclipses and on southern skies. Forty people despite due warning against disappointment met on deck at three o'clock one morning to see the Southern Cross at its best, due upright on the meridian. One old lady remarked somewhat disconsolately, "Looks to me like a coffin." When I saw from whence it came I forgave her—for her years—and I am sure the stars did also.

A week from Colombo we were in the Red Sea. Passing on a Sunday afternoon the peaks of Sinai, we felt ourselves indeed in the land of one of the oldest civilizations. At Suez we entered the Canal through which we steamed all day arriving at Port Said at nightfall.

Next day while the *President Polk* proceeded to Alexandria, we journeyed to Cairo. Threading our way through the Nile Valley we watched from the car windows the activities of primitive life. Caravans of camels crossed the desert. Dabijoh boats with their lateen sails navigated the streams. Arabs in motley attire as of old ploughed their field with crooked sticks and yokes of oxen. Here and there along the dusty roads trudged a patriarch whose beast of burden conveyed his wife and child in swaddling clothes as in the days of the

Nativity with its hasty flight to Egypt. With crude machinery and creaking wheels water was lifted from the canals to irrigate the garden plots—oases in the desert. Perhaps the most interesting of all the irrigation machinery was the Archimedes spiral whose winding helix was turned round and round by Arab hands while the up-flowing water spilled itself upon the thirsty soil.

Arriving at Cairo we went at once to the Museum and were fortunate to be able to see some of the newly exhibited furnishings from the tomb of King Tutankahmen. Late afternoon was spent at the Pyramids of Ghizeh. Standing by the Pyramid of Cheops with its secret passage directed confidently to the sky where stood Alpha Draconis on the meridian of the Nile Valley four thousand years ago, one pictured this gigantic mound of stones not only as a monument built to endure through the ages, but a veritable astronomical observatory. Though scarred with the ravages of the Moslem vandals, it stands as silent witness to a recorded astronomical knowledge which could not be burned or buried by the ravages of time.

The return trip across the Mediterranean by way of Alexandria and Naples brought the sudden contrast of civilization which marks the occident from the orient. Once on the soil of Europe one feels next door to home. We lingered at Naples long enough to glimpse the excavated Pompeii and walk the streets once buried with the ashes of Vesuvius whose smoking crater stood above us.

Here our paths divided, Dr. Coblentz to visit physical laboratories in Europe, Mr. Arnold and Mr. Spurr proceeding to Genoa.

Crossing Europe I stopped at Rome, located Father Hagen at the Vatican Observatory where we had a most delightful visit and paused at Pisa just long enough to follow again the footsteps of Galileo up that slanting tower where he defied the conventions of Aristotelian science. After a brief stop in Paris, three days in and about London resulted in a most delightful visit at the Royal Observatory at the Imperial College, South Kensington and at Kings College where by good fortune Professor Eddington was giving a series of lectures on Stellar Constitutions.

Returning on the "Majestic" from Southampton on March 3 and docking at New York on the morning of the tenth completed the last leg of a 27,000 mile trip, all for three minutes of opportunity to catch some further data on the solar corona. Incidentally from the point of view of personal satisfaction we proved for the n^{th} time that the world is round.

A more technical presentation of the observations and results will be forthcoming when the measurement of all the photometric plates has been completed and the data have been reduced to a form for a more critical discussion. Preliminary deductions indicate a much brighter corona for the Sumatra eclipse than for that of the eclipse of 1925.

Harvard University, Astronomical Laboratory.
May, 1926.

THE FIREBALLS OF NOVEMBER 15 AND DECEMBER 29, 1925.

By WILLARD J. FISHER.

In the morning papers of Nov. 16, 1925, the fall of a remarkable bright daylight meteor somewhere in New England was reported. As the matter seemed to be of scientific importance, Director Shapley, of the Harvard Observatory, decided that information about it should be collected; and questionnaires were immediately put in circulation, through the Harvard University Bureau of Publicity, which distributed them to the press, and through Station WEEI. The response was immediate, and within a week about one hundred forty reports of eye-witnesses had been received.

When the observers' stations were plotted on a map of New England, the points were dense about Boston, and thinned out from there in all directions; but south of a line drawn across Massachusetts from Chathamport to New Ashford, there were no observers. Inquiry developed that this could not be explained by clouds in southern New England; hence it must have been due to the rotundity of the earth. A normal to this line must indicate the general direction of the meteor, as, indeed, it does.

The object itself was described as a glowing, glaring ball of golden fire, which dragged a bright tail after it, but left no train in the sky. It plunged sharply downward, E to N, and many observers said that it either vanished or exploded above the horizon of eastern Massachusetts. Many, in widely separated places, were confident that they saw it drop to earth within a few miles or a few rods. The most promising of these reports was investigated by a representative of the Harvard University Department of Mineralogy, who found no foundation for the statement of a fall. The general bearing, as seen from the neighborhood of Boston, and determined by compass observations of noted landmarks, was N 17° E. At the Vesper Club, Tyng's Island, in the Merrimac River, it was N 22°.5 E; at West Pawlet, Vt., N 65° E; at Swiftwater, N. H., N 52° E. These, with others more roughly taken, indicate that the meteor ended over the great bend of the Androscoggin River, in southern Oxford County, Me., if it did not come to earth there. The time of apparition was very well determined as 10:28, by several timepieces and by the ringing of the church bells, as noted by many people who saw the meteor while on the way to church.

Several observers sent in finished and instructive pictures of the meteor, of which Figure 1 is an example.

This meteor could not have come from the Leonid radiant.

Again, in the morning papers of Dec. 30, 1925, remarkable bright meteors leaving brilliant and long-lived trains were reported, from

points in Quebec, Ontario, the New England States, New York and Pennsylvania. Dr. Shapley again felt that the matter should be followed up, so a questionnaire was put in circulation that afternoon, through the same agencies as before. At the Dominion Observatory,

FIG. 1. Fireball of Nov. 15, 1925, as seen at the Vesper Club Course; sketch by F. W. Hale.

Ottawa, similar appeals were sent out in the same manner, through press and radio, and some thirty or forty replies were received. After correspondence between Director Shapley and Director R. Meldrum Stewart, and after consideration of an offer to turn over to the Dominion Observatory the data collected at Harvard, it was decided to place in the hands of the writer, at the Harvard Observatory, all the reports received at Ottawa; which made a total of over two hundred sixty reports to be discussed.

After a search in the bookstores and stationery shops of Cambridge and Boston, there was selected, as a base map for plotting, an automobile road map, scale 25 miles to 1 inch, covering Ontario and the eastern United States, from Evansville to the St. John's River. This map lacks meridians and parallels, but has numerous place names, and is accurate enough.* On it the place of each observation reported was marked with a large blue dot. These dots were dense about Boston and New York City, and quite numerous in the southern half of New England, in northeastern Pennsylvania and in the Susquehanna Valley in southern New York. From Johnstown, N. Y., westward in the densely industrial region of central New York, and westward from the Finger Lakes, few or no observations were reported. The extreme points were Orillia, Ont., Chipman, N. B., Madison and Monhegan, Me., Block Island, Spring Lake Beach, N. J., near Easton, Md., Bridgeport, W. Va., and Newark, O. In fact, it was cloudy or rainy about Lake Ontario and westward.

The moments of apparition were reported generally as estimates, in some cases with half an hour leeway. However, a few persons had referred to watches or clocks. All times in the following are W 75°, Eastern Standard, unless otherwise stated.

The reported azimuths or bearings were regarded as "precise" if stated to one "compass point," or related in some way to landmarks or planets, etc., so that they could be deduced with such a precision. In most cases the azimuths were *general*, not distinguishing the ends of a meteor's path. The precise azimuths were first plotted on a small scale map, and were found to indicate several meteors, instead of one only. This has greatly complicated the interpretation of the data. Trials in detail showed that these could not be separated by means of the reported times, even by watch and clock times, for the meteors seemed to have come too close together. Also the reported altitudes could not be used for separation, as they seemed in most cases to be estimated too high. It was not safe to use descriptions of the meteor trains, for meteors of a group would be not unlikely to form similar trains, which would be subject to like distortions in the air. The only recourse was to azimuths; so *all* the azimuths were plotted on the map, the precise in red, the rough in blue. The map looked as if it had been strewn with red and blue jackstraws, especially in the neighborhood of Boston and New York City. But the density of intersections of the azimuth rays,

*The airline distances between state capitals, as given in a table of the U. S. Geological Survey, were compared with distances measured on the map. It was found that, in the area of observations, distances measured in millimeters on the map, less 1/250, give the tabular distances to 1 statute mile or less. The lack of meridians is an inconvenience, but is not insurmountable; and azimuths drawn or measured on the map are only needed for qualitative indications. The exact intersections of lines of sight were determined by observers' positions measured on Century and Hammond atlas maps and by special computation and plotting, as shown later. Computations of heights, however, were based on road map distances and the angles of elevation reported. In comparison with the best of these angles, an error of a mile on the ground is unimportant.

"sight-lines," prolonged made it probable that there were meteors as follows:*

(1) A meteor from SE to NW, nearly over New Haven, Ct.; at 5:22 by a watch accurate to 1 sec (Prof. E. S. Dana), with several estimates agreeing pretty well. The reported durations of flight agree ill. The train was visible some time; by one clock, 8 min, (but this observer's statements, both as to azimuth and moment of apparition, make it possible that the object was different). Another observer estimates the duration of the train as 8 min. Four lines of sight intersect in an area south of Montauk Point. One report of brightness says, twice that of brightest planet. Six reports seem to refer to this meteor.

(2) A meteor from SE, at 5:28, mean of six, all apparently estimates. This seems to have gone nearly over Medway, Mass., and to have vanished low down. The durations of flight agree ill. There was a train, enduring "several minutes," 3 min, 5 min. One observer saw the train high over Boston, only after the meteor had passed. As to brightness, observers say, "enormous star," "gigantic star," "larger than Jupiter." The azimuths are not precise enough for use. Nine reports seem to refer to this.

(3) A meteor going toward some northerly or northeasterly direction, over a region near Johnstown, Pa., at 5:25, by a watch "keeping standard time," with eight fairly agreeing estimates. Duration 4+ sec, mean of two estimates. Duration of train probably about 12 min, by notes on sketches, or 20 min by another report. The reports on which the position is based are:

Belmont, Vt., Mrs. O. A. Priest; W 15° S, magnetic (= about N 120° W, true).
Bethany, Ont., H. Russell; directly south.
Bridgeport, W. Va., Mrs. D. F. Corpening; facing the northeast.
Charlestown, W. Va., H. K. Ambler; appeared W of NW, disappeared N of NW.
Easton, Md., (6 mi NNW), L. S. Arnold; W by NW.
Harrisburg, Pa., S. C. Spengler; in west.
Jersey City, N. J., A. Magonan; by sketch. S of W.
Perth Amboy, N. J., C. S. Heberlin; W to NNW.
Sayre, Pa., Percy Reeves and Mrs. Reeves; by sketch. train S of W. N of Venus. (The interesting sketches by these observers are shown in Figure 5.)
South Orange, N. J., J. Arnold Pulsford; W 10° N.
Worcester, Mass., G. Lowell Field; WSW.

These azimuths cannot be used to define either end point. Perhaps some of the points referred to the Bloomsburg position could be placed here, as Boston, Bloomsburg and Johnstown are nearly in a straight line; but the nearer point has been preferred.

Of the brightness of this meteor, observers say: "Astral body of great magnitude"; "Glowed with a white heat"; "a brilliant, almost

*A good many reports (at least twenty) cannot be reconciled with any position so obtained. Most of these are so careful and detailed that they must refer to meteors in addition to those listed here. Three of them give moment of appearance, determined by watches or railway train positions, certainly previous to 5:20. Six of these reports have to do with bright meteors lacking trains. In general, one is reminded of the meteoric procession of February 9, 1913.

blinding, white in color, many times larger than the largest falling star"; "about half the size of the moon in width."

Eighteen observers seem to refer to this meteor.

(4) A meteor over the west end of Lake Ontario, Oswego to Clayton, N. Y., perhaps as far northward as the zenith of Ottawa. One watch, at Norwood, Mass., read 5:20, as first observation of train, which was followed to 5:45. The observer at Williamsport, Pa., saw the train from 5:24 to 5:28, doubtless watch times. Various estimates range from 5:00 to 5:30. The observations for position follow:

Williamsport, Pa., H. B. Mussura: train only observed; upper end N 10°.5 ± E, lower end N 13° ± E, by compass reduced to true bearing. Altitude (upper end?) 48° ±, slope 70° NW (sketch). Evidently very carefully done.

North Creek, N. Y., B. Andrews; letter not dated, but doubtless refers to Dec. 29; train only observed. The first of four sketches shows a straight thick train prolonged by a short thin train; hour "about 5:30." On the two sides of the train are two stars marked "large star," to right, "small star," to left. The slope of the train, measured on the sketch, is 35°. Trial shows that Venus and Jupiter cannot be the two stars, for the direction in general is stated to be "directly in the west"; but Vega and Altair fit very well. A straight line was drawn on the sketch through "large star" and "small star"; by measurement and linear interpolation between Vega and Altair the intersection of this line with the mid-line of the thick train has computed position N 93°.5 W + 27°. Plotting on a celestial globe, the points from upper end down are, (1) N 100° W + 30°; (2) N 92°.5 W + 27° (to check with the above); (3) N 79°.5 W + 20°.5; (4) N 71° W + 15°.5, end of the thin train. These are presumably as accurate as the data can give. This report is evidently very careful.

Sharon, Vt., H. A. Aldrich; appeared a little S of W, disappeared almost NW; initial altitude one-third up to zenith, disappeared behind the horizon. Slope 45°±, duration of train 10 or 15 min.

Touisset, Mass., W. Anthony; appeared about NW b W, disappeared about NW; train lasted 15 min, flight 5± sec; slope at first 45°, then straight down.

The Williamsport and North Creek reports are the most precise. Plotting on the road map, they place the upper end of the train, projected on the ground, 4 mi due S of Oswego, N. Y., and the lower end, similarly, 2 mi due W of Clayton, N. Y.; course N 19° E; length on ground 63 mi = 101 km. Using the points as numbered under the North Creek report, and measuring distances on the map from North Creek, the heights of these points come out: (1) 122 km; (2) 102 km; (3) 70 km; (4) 52 km. Or, computing point (1) from the height of point (3), the projected path length and the slope 35°, again the height is 122 km. Point (3) seems to have been the bursting point of the meteor, recorded in the train.

The estimates of duration are "short," "few seconds," 2, 5, 5±; mean about 4 sec. From these no velocity can be derived, for, the mean time is too uncertain, the precise observations are of the train only, after the flight by an uncertain interval, and the lower end seen at Williamsport may not be the thin lower end of the whole train seen at North Creek. If it is the lower end of the *thick* train, then the projected length is about 46 mi = 74 km.

Of the brightness of this meteor reports are: the size of Venus, only red; twice Venus; bright streak of light in the western sky, from which shot a star at the lower end; brilliant ball of flame; one-third to

one-half the diameter of the moon; about the same brilliancy as Venus.

The direction and slope of the meteor, the computed bursting height, and the changes of the train, as shown by the sketches from North Creek and elsewhere, show a great resemblance to the corresponding data of the Hornell fireball, below.

Thirty-five reports seem to refer to this meteor. But among them are some which point fairly concordantly in the general direction from Boston to Massena, N. Y., and Ottawa. Among these might be counted the reports from Sharon, Vt., and Touisset, Mass. It is impossible to disentangle any further definite information, for lack of cross bearings. But this Oswego-Clayton meteor and the other, if any, towards or beyond Massena, seem not to have been reported from Ottawa, on account of great angular height, or other difficulties.

(5) A certain number of observations, more or less definite, indicate one or more meteors either over Lake Ontario or to the north or west of the lake. Azimuth lines are dense on Lake Ontario, about halfway across south of Colborne, Ont.; near Guelph, Ont.; a little east of Rice Lake; and in the neighborhood of Gull Lake. Some of the observations cannot be satisfied by any of the meteor positions elsewhere on this list:

Rideau Ferry, Ont., Miss D. Hall; directly west.
Clarksburg, Ont., Mrs. A. Gibson; S, from sketch oriented by buildings.
Hamilton, Ont., Mrs. J. L. Coomber; coming from S.
West Fairview, Pa., C. C. Britten; in a northerly direction.

(6) Several precise and rough azimuths seem to indicate a meteor over an area east of Bloomsburg, Pa. The moment of apparition was 5:25.5, mean of two watches, one of them noted as checked by Arlington radio and accurate "to seconds." Another observer says 5:25 "almost exactly," and still another estimated 5:26 from the docking time of the North River ferry boat from whose front platform he saw the meteor. Numerous observers estimate about 5:30, and some whose estimates range widely include 5:25.5. The duration of flight was 2.5 sec, weighted mean of eight estimates and one count of seconds by the formula: one thousand one, one thousand two . . . ., which gives an easy method of measuring a few seconds without reference to a watch. By this, J. W. De Bruyn got 3 sec; in averaging, his observation was weighted 10, all others 1 each. The duration of the train was 7.3 min, mean of three watches; others reported estimates of 2 min to 20 min. The direction of motion was northerly. The data on altitudes are hopelessly inconsistent. The mean slope, by five estimates at positions fairly favorable, was 30°.4, down to N.

Mr. De Bruyn was at the corner of Dartmouth and Boylston streets, Boston, when the meteor flew. From his diagram and description the initial point was over the Hotel Lenox, the ending point low and a little to the right (N) of the curb line of Boylston St.; this would make his line of sight practically parallel to the curb line, hidden by posts, etc., a short distance away. This street line prolonged as a great circle passes south of Hazleton, Pa. The data do not supply a determination of the end point. It is unfortunate that there was no other precise report to use with this.

One may raise a question as to the real existence of this meteor, whether

the group of intersections is not due simply to the crossing of lines of sight from Boston and vicinity to Johnstown with others from New Jersey and the vicinity of New York City to Hornell and the Thousand Islands. But, unless one goes back of the evidence, this has as good standing as the meteor from south of Montauk Point. Twenty-two reports seem to refer to this meteor.

(7) Of all the meteors which appeared on the evening of Dec. 29, the one most widely observed was over a region near and south of Hornell, N. Y. From ninety-six reports apparently relevant to this the following data have been derived:

Apparition, mean of 8 timepieces, 5:26:15 ± 1 m. Spread, 23 m to 30 m.

Duration of flight, mean of 14 estimates, 3.14 s ± 0.5 s. Spread, 2 s to 6 s. One-eighth of this used.

Duration of train, accepted value, from a clock, 20 m.

Duration of train, mean of 9 watches, 10 m. Spread, 4 m to 15 m.

Explosion or ending point, projection on ground, from plot of three lines of sight, N 42° 18′ ± 2′, W 77° 32′ ± 5′.

Beginning point, projection on ground, from plot of six lines of sight, N 41° 51′ ± 5′, W 77° 46′ ± 7′.

Inclination to horizontal, from 7 sketches and 5 estimates, 35° ± 7°. This includes a correction for perspective, based on a vertical plane of motion nearly through Ottawa, N 22°.5 E from the ending point.

Path length, projection on ground, measured on plot, 28′.6 ± 8′ = 32.9 ± 9 mi = 53.0 ± 14.5 km.

Inclined path length, from above, 40.2 ± 7.0 mi = 64.7 ± 11.0 km.

Velocity relative to earth's surface, 12.8 ± 2.2 mi/sec = 20.6 ± 3.5 km/sec.

Height, ending, 41.0 ± 1.0 mi = 66.0 ± 1.6 km.

Height, beginning, 64. ± 7 mi = 103. ± 11 km.

In this table the number following ± represents, not the "probable error" of least squares, but the largest error which the writer would admit. It is commonly found here by taking one-fourth the result of the spread of the data selected, except as noted.

The derivation of the above data will next be discussed.

The weather in the neighborhood south and west of Lake Ontario was apparently cloudy, elsewhere, to north, south and east, beautifully clear. The moment of apparition was after sunset, while the lower sky was still glowing. Venus and Jupiter were bright in the southwest and west, but very few observers say anything about the visibility of any stars beside, and most, who do, say that none were visible. One uses Polaris as a reference point. One or two refer to the position of the recent sunset, or to the sun where it would be when "an hour high." The references to planets were the most useful.

The moment of apparition given above is the unweighted arithmetic mean, as are also the duration of flight and the duration of train.

Having found that numerous azimuths plotted on the road map indicated a meteor near Hornell, N. Y., the position of this place, was taken from the atlas, N 42° 20′, W 77° 40′, and used as an arbitrary origin. It is important that this origin be near the meteor path, but its

accuracy as to Hornell is of no account; it is like the assumed position in the St. Hilaire method in navigation. This origin was taken at the middle of a sheet of squared paper, scale 1′ = 2 mm; *i. e.,* the plane of the paper was made tangent to the sphere at the arbitrary origin. The line of sight of each observation used (derived from observer's station, taken from an atlas map, and the reported or deduced azimuth at station) was plotted across this sheet by bearing and length of a normal from origin to sight line. The mass of "general" sight lines made it clear that the region had been properly selected, and certain of the more precise observations of the end point located the projection of the point on the plot quite exactly.

For computing these lines of sight the rhumb line methods of dead-reckoning navigation fail. It is evident that if an observer says the object was "due west," it must be found in a latitude lower than his, and not on a westerly rhumb line, a parallel of latitude.

For fireball reductions the spherical trigonometry required is simplified by the facts that observer and object are not likely to be over five or six degrees apart, and that the observations are at best so crude that the flattening of the earth is unimportant, so that an average value of the radius will serve well enough.

Either of the following methods puts the computing within the power of a ten inch slide rule.

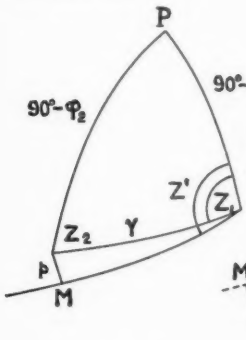


Fig. 2

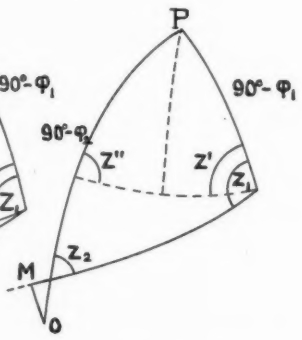


Fig. 3

In Figure 2, P is the small difference of longitude of the observer's station (latitude ϕ_1, at vertex Z_1) and the arbitrary origin (latitude ϕ_2, at vertex Z_2). Then, by a formula of spherical trigonometry, in which small angles or arcs have been made equal to their sines, the distance γ is found from

$$\gamma^2 = (\phi_1 - \phi_2)^2[1 + \cos\phi_1 \cos\phi_2 \, P^2/(\phi_1 - \phi_2)^2] \text{ very nearly,}$$

and also $$\sin Z_1 = \cos\phi_2 \, P/\gamma, \quad \sin Z_2 = \cos\phi_1 \, P/\gamma.$$

The bearing of the meteor being $PZ_1M = Z'$, the normal p from the origin Z_2 on the line of sight Z_1M is given by

$$p = \gamma \sin (Z' - Z_1) \text{ nearly.}$$

This is drawn from vertex Z_2 in the direction given by assuming the small triangle Z_1Z_2M a plane triangle; whence the bearing of M from Z_2, to be taken with

the proper sign, is

$$90° - (Z' - Z_1) + Z_2 \text{ nearly.}$$

This solution fails in practice when Z_1 and Z_2 are nearly right angles, and so are badly determined by sine. Then the second method is valuable. In Figure 3, P is the difference in longitude between the observer's station at Z, and the origin O, Z_1Z_2M is the line of sight to the meteor, ϕ_2 is the latitude of the point Z_2 where this line of sight cuts the meridian of O. On PO cut off an arc $= 90° - \phi_1$, draw the base $Z'Z''$ of the isosceles triangle, and bisect P, forming equal right triangles. Then

$$\cot Z' = \tan \tfrac{1}{2}P \sin \phi_1,$$

or, in the practical case, Z' being but little smaller than 90°,

$$90° - Z' = \tfrac{1}{2}P \sin \phi_1 \text{ nearly.}$$

$$\text{The base arc } Z'Z'' = P \cos \phi_1 \text{ nearly,}$$

$$\text{and } Z_2 = 180° - (Z_1 + P \sin \phi_1) \text{ nearly.}$$

$$\text{Whence } \phi_1 - \phi_2 = P \cos \phi_1 \tan (Z_1 - Z')[1 + \tfrac{1}{2}P \sin \phi_1 \cot Z_2].$$

The normal $OM = (\phi_2 - \phi_0) \sin Z_2$, in which ϕ_0 is the latitude of the origin O, and it is drawn from O in a direction given by $\pm(90° - Z_2)$.

This second method was generally used in computing sight lines, without the bracketed factor, Z_2 being usually fairly large. When both methods were used, the omission of the bracketed factor gave results agreeing with the first method within the limits of uncertainty due to the data, including the observer's position. This last is almost always as much as a half arc-minute, and generally much more.

Having plotted the lines of sight, for a point on a meteor path, the projection of this point on the ground is found by measuring the coördinates of their intersections, weighting these coördinates according to judgment, and finding the weighted means. These give differences of latitude and longitude with regard to the arbitrary origin, and so latitude and longitude of the projected point.

To find the height of a point on the path, from reported angular altitudes, a formula was derived in which the effect of atmospheric refraction was introduced. But the errors due to neglecting refraction were found to be negligible compared with the discordances of observations. In fact, except when comparisons with planets were made, the tendency was to exaggerate the angular altitudes. Consequently this simplified formula was adopted, for height H at surface distance D, earth radius R:

$$H = d^2/R + d \tan e$$

in which refraction is ignored, and d^2/R is a curvature term, $d \tan e$ is a term due to angular elevation e. With this, the height was computed with the reported altitudes, and such results as seemed absurd were rejected. The usable heights were weighted by $\sin 2e$, to weaken very small and very large distances from the object, and by a factor representing the writer's judgment as to the intrinsic quality of the observations.

The angle of inclination was cleared of perspective effect by the formula

$$\tan I = \tan i \sin Z$$

in which i is the observed inclination, I the true inclination, and Z is the difference in azimuth, at the lowest point of the path, between the vertical plane of the motion and the observer's station. This is inaccurate, because it assumes the observer to be on a plane level with the lowest point of the path; but the observational discrepancies are such that this error is of little importance. Values of i were used, observed at favorable places and which seemed reasonable. The simple mean of $\tan i \sin Z$ was computed, and from this, I.

The ending point being much better determined than the beginning, the height of the beginning point was found from height of ending point, projected path length and inclination. The plane of motion was known from the stations which reported the inclination as 90°, a vertical line. These were in the direction of Ottawa, Ont. (In finding the projection of the initial point, the weights of intersections were influenced by the direction of this plane; the projection was forced toward this plane by weighting.)

The observations used for projected ending point follow:

Hull, Quebec, W. H. Coombs; SSW. (This also served as an observation of the beginning.)

Peterborough, N. H., Mrs. A. C. Vaughan; disappeared about at the peak

of Mt. Monadnock. The observer marked the position of her home on a topographical sheet, which gave a distance between sighting points of over eight miles, and enabled a good measurement of azimuth to be made on the same map; N 96°.0 W.

Binghampton, N. Y., J. R. Weeks, Meteorologist, U. S. Weather Bureau; 280° true, by compass observation of train within three minutes after the meteor flight.

The observations for projected beginning point follow:

Hull, Quebec, as above.

New Haven, N. Y., G. N. Lindsley; appeared directly below Venus; (=N 142°.2 W).

Glenfield, N. Y., Mrs. F. G. Bates; by interpolation on sketch, between Venus and Jupiter, N 139°.4 W.

Peterborough, N. H., Miss A. B. Cutler; appeared just to the left of the peak of Monadnock. The observer marked on a topographical map the position of her home, which gave azimuth of the mountain top, N 98°.9 W, and the direction of the correction.

Binghampton, N. Y., as above; 260° true.

New Haven, Ct., D. M. Hetler; by observation through noted leaded window panes, and later of time, with α Tauri in same azimuth through the same window, N 82°.8 W. Apparently with great care.

The most important observations on inclination were those made where the path was seen as a vertical line. These were:

Morrisburg, Ont., R. L. Duval.
Ottawa, Ont., C. M. Keillor, M. D.
Sharp Corners, Ont., G. H. Brooks, sketches.
West Ottawa, Ont., Rev. John A. Bradford, sketches.
Chelsea, Quebec, Rev. E. Geoffrey May, sketches.

The observations of inclination next in importance were those made at positions well removed from the plane Hornell-Ottawa, *i. e.*, particularly in New Jersey and about New York City. These follow. All the slopes given are of course rough. Those taken from sketches were measured with a protractor.

Amherst, Mass., M. O. Lanphear	30°	from sketch
Arthursburg, N. Y., G. R. Thew	45	
Boston, Mass., J. F. Leahy	35	
Brooklyn, N. Y., W. R. Ryan	29	from sketch
Easthampton, Mass., W. J. Lee	56	from sketch
Manchester, N. H., Miss M. Lathe	30	from sketch
Mansfield, Mass., F. S. Boltz	50	
Moosup, Ct., T. J. Seaton	55 to 40	from sketch
Palmerton, Pa., H. M. Cyr	30	from sketch
Ponkapoag, Mass., S. Cobb	23	from sketch
Roslindale, Mass., E. T. Jones (parallel to line joining Venus and Jupiter)	49	
St. Johnsbury, Vt., C. O. Peterson	30	from sketch
Wilkes-Barre, Pa., P. L. Drum	45	

Using all twelve, with equal weights, mean tan i sin Z = 0.696+, spread 0.39 to 1.11; adopted $I = 35° \pm 7°$. Z was measured on the road map, with center the projected ending point, from the direction of Ottawa, to about ½°.

The height of the ending point was deduced from the following:

Apponaug, R. I., G. S. Wallace; about the height of Jupiter.

Binghampton, N. Y., J. R. Weeks; estimated altitude at northern end, 3 min after meteor flight, 20°.

New Haven, Ct., D. M. Hetler; from dimensioned diagram, 5°+.

Ponkapoag, Mass., Sidney Cobb; 13°, estimated.

Williamsport, Pa., E. S. Hippey; 30°, estimated.

Weighted as described above, the height is 42.1 mi.

An independent check on these altitudes was supplied by an observation of the vanishing redness of the train, which was noted by many observers. Mr. Walter Gilgallon, Scranton, Pa., remarked about the train immediately after its formation at 5:26:

"End nearest earth rose-red, rest lighter, not less brilliant. In about a minute, color softened; after two minutes, smoky."

At 5:28, the height of the lowest sunlight over Hornell was 40.0 mi. This depends on the following data:

Horizontal refraction = 34′, standard conditions; barometer, 30.5 in, thermometer, 15° F, estimated from 8 AM weather maps of Dec. 29, Dec. 30; center of sun on horizon of train. The formula used is

$$H = R\,[n \sec (h + 2r) - 1]$$

where n = actual index of refraction of air at earth's surface, h = sun's true altitude at Hornell, r = actual horizontal refraction at earth's surface; h and r are both negative.

The mean of 42.1 and 40.0 is 41.0 mi, adopted as the height of the end point. This is not regarded as being over 1 mi in error.

The initial point computed from this, projected path length and slope, = 64 ± 7 mi.

A high intermediate point was calculated from an estimate referring to Venus, by W. S. MacQueen, Ogdensburg, N. Y. This gave 56.6 mi, which is consistent with the initial and end heights above.

The numerical results above are reasonable, not excessive, on comparison with values given by other meteors in the past. The method of least squares has not been used in the calculations. The writer has picked and chosen among the data, and weighted data according to his judgment.

By the usual methods, but neglecting diurnal aberration, orbit elements are derived from the mean values above, as follows:

Correction for zenith attraction, 5° 10′+.

True zenith distance of apparent radiant, 60° 10′+.

Azimuth of apparent radiant, 202°.5 true.

Local sidereal time at ending point, $23^h\ 47^m\ 31^s.4$.

Longitude of apex, 187° 50′.9.

Elongation of apparent radiant from apex, 144° 49′.

Velocity of meteor, heliocentric, 41.77 km/sec.

This may be compared with sun's parabolic velocity at mean distance of earth, 41.85 km/sec. The remarkable smallness of the difference must be laid to happy chance. But the meteor must be considered to have had parabolic velocity.

Ecliptic coördinates of true radiant, 354° 11′, −2° 02′, i = +2° 05′, log q = 9.9679, ☊ = 97° 47′, ω = 332° 49′.

From the possible errors of the mean values adopted it is evident that the above elements are subject to considerable errors. But the motion was certainly direct, and the apparition after perihelion.

In the lists of comets by Valentiner and by Crommelin, revising and extending Galle's "Cometenbahnen," no elements are given which fit the above well enough to suggest an identity. And also this meteor does not belong to any noted shower swarm, in spite of its nearly parabolic velocity.

In the following the reports on the brightness of the Hornell meteor are arranged in the order of distance, approximately in miles, from the projected end point:

115 mi Scranton, Pa., W. Gilgallon; ball of fire, about six times as large as Venus.

212 Sharon, Ct., Dr. C. W. Bassett; round, one-half the diameter of the full moon, pale yellow.

216 Brooklyn, N. Y., W. R. Ryan; brilliant greenish white.

257 Amherst, Mass., M. O. Lanphear; large glowing ball on the forward end . . . . Light from the ball [bright enough] to make a flash in my room.

284 Gardner, Mass., J. A. Brouillet; . . . . first dark red . . . . became a brighter red . . . . gigantic size . . . . from a bright red to a white, like welding heat.

314 Manchester, N. H., Miss M. Lathe; round, about twice as large as Venus. Bluish white, around that yellow. This went into red.

320 West End, N. J., L. Mayer; ball of fire, turning red. Like a search light shining through a dark sky.

324 Ponkapoag, Mass., S. Cobb; bigger than Venus.

329 Roslindale, Mass., E. T. Jones; at first as bright as Venus, increased to size of full moon overhead.

346 Newington Center, N. H., J. F. Hoyt; a very large, golden bright star.

The flight of the Hornell meteor is very variously described. A few selections from the accounts follow:

Arthursburg, N. Y., G. R. Thew. First like a shooting star, then looked like a large comet. Suddenly the comet left the tail behind and descended to the earth.

Gardner, Mass., J. A. Brouillet. I saw a meteor or fireball coming from the south headed toward the earth in a northwest direction. . . . . it burst in several pieces, the main body disappearing and the fragments going in all directions and remaining visible for a second or two, then disappearing one after another.

Lancaster, Mass., Miss G. W. Quincy; . . . . a falling star . . . . rather low in the western sky a brilliant streak of light, somewhat resembling a rocket, shooting down toward the horizon, only not straight, but with a zigzag in its course. Then suddenly it seemed to flash off a lot of brilliant streaks, and a ball of fire apparently dropped off the end and fell toward the horizon. . . . .

New Haven, Ct., D. H. Wenrich; (sitting in front of a west window) . . . saw what appeared to be a very bright star . . . . it suddenly started off at a tangent toward my right (northerly), leaving behind it that beautiful luminous wake . . . . and then burst. There seemed to be many fragments, at least one of which made a light streak as it fell almost directly downward . . . . At first the wake was double, a dark streak down the middle indicating that the luminous material was thrown off on either side. The dark streak soon disappeared. . . .

New Haven, N. Y., Grant M. Lindsley; . . . . unobstructed view in all directions . . . . and was noting the brightness of the night and particularly that of the evening star . . . . when . . . . seemingly directly below this star a ball of fire shot in a zigzag course in a westerly direction. The first part of its course seemed to be diagonal in a westerly direction, then perpendicular, then diagonal in a westerly direction . . . . went behind a small cloud . . . . Almost immediately from the beginning of the flash a serpentine cloud appeared. . . .

Peterborough, N. H., Miss A. B. Cutler; . . . . a star directly in line with the top of the mountain (Monadnock) exploded and dropped. . . . . leaving a trail of bright yellow light behind, ... then the ball of fire detached itself and dropped the remainder of the way, leaving no trail, and disappeared. . . .

Schenectady, N. Y., D. O. Woodbury. Meteor not seen in flight, but . . . . its trail of smoke, which was at first very brilliant and then faded out, in about 12 min. . . . . at near 5:30 it appeared as an almost pure white streak across the sky, low down, just at the upper level of the afterglow . . . . perfectly straight and seemed to have a very slow motion in our direction. It did not become any larger as I watched it. A minute or two later the upper half of the streak began to bend to the right, and to move fast enough to be easily perceptible. [Then 2 min. exposure with f/7.7.] While I was taking the picture the color of the meteor gradually changed from white to pink and then to red, and later faded and spread out, coming more and more rapidly towards us . . . . The portion of the streak away from us did not seem to be moving and remained about where it was first seen . . . .

Scranton, Pa., Walter Gilgallon. The initial appearance of the fireball was at the highest point in . . . . its path . . . . seeming a quarter-circle . . . . It appeared as a ball of fire, about six times as large as Venus . . . . A tail of flame followed it until it had passed through an arc of about 45°, when it ap-

peared to rest for an instant, at which time two bright pieces shot out from it, with another piece of lesser brilliancy in the center of them . . . . The tangent width of the three pieces was about the diameter of the fireball, and they led the fireball to the horizon by an arc of about 15°.

At the spot where the fireball seemed to stop momentarily, a bright red light, of apparently light density, remained in the sky, although the fireball almost instantly continued on its way to the horizon. From this red spot, a path about the width of the fireball, and forming an arc of about 22°, became suddenly illuminated. The position of this illuminated arc being about 23° from the place where the fireball first appeared, and continuing to 45° from the starting point. The end of this path nearest the earth was a rose-red color, and the rest a lighter color, but not less brilliant. In about a minute the color in this illuminated ribbon softened considerably, and after two minutes it appeared smoky, like a white cloud. At the end of four minutes the ribbon buckled in the center and formed a Z, the illumination becoming dimmer, and the width and length of the arc about twenty-five per cent greater . . . .

West Ottawa, Ont., Rev. J. A. Bradford. . . . . my attention was drawn to a luminous body having the brightness of a star descending in a perfectly perpendicular manner until it reached a certain point, when particles of luminous matter began to scatter, in appearance like the bursting of a rocket, diagonally towards the earth. From the midst of this spread of luminous matter appeared a ball of fire steadily increasing in size to fairly large dimensions. Its circumference was of a reddish tint having an exceedingly bright center. Then all of a sudden it seemed to burst and immediately vanished . . . . deliberateness of the whole affair . . . . ample time for observation.

Besides the observers quoted above there were many who described the flight and the train. In the descriptions in general there is much variation in detail. The motion is zigzaz or straight, halting or continuous, the head bursts or no bursting is mentioned, the train is initially straight, becoming crooked as it dissipates and fades, or it is crooked from the first.

Bursting of the meteor, or the projection of small objects onward and downward, is recorded as follows, by observers who saw the flight: Yes, 17; no, 1; no mention, 40; total, 58.

If any of the fragments reached earth, they should be looked for along the path-projection prolonged, from Naples, on either side of Canandaigua Lake, to Manchester, Sodus and Lake Ontario.

Twenty-one observers say the train was initially straight, as seen from points of view from Trenton, Ont., by the east to Apalachin, N. Y.; eleven say it was initially (or very soon) crooked; thirty-nine in all mention its crookedness as occurring sooner or later.

As to the form of the crooked train, six observers sketch or describe a nose-shaped bend formed in the upper third of the straight train, on the upper or eastern side. A curious loop at the upper end of the train is described or sketched by five observers, at stations which extend, as seen from Hornell, over more than 270° in azimuth.

Certain observers speak definitely of the motion of the train as a whole. These are:

Binghampton, N. Y., J. R. Weeks, none; Mrs. J. B. Dunning, none.
Branchport, N. Y., J. W. Nevyns; drifted toward east.
Cobourg, Ont., F. McAnerin; traveling southeast at great speed.
Lancaster, Mass., Miss G. W. Quincy; did not change its location—watched it against some trees.
Roslindale, Mass., E. T. Jones; drifted up from the horizon quite rapidly.

Schenectady, N. Y., D. O. Woodbury; seemed to have a slow motion in our direction . . . . coming more and more rapidly towards us. The farther portion of the streak . . . . did not seem to be moving, and remained about where first seen.

Sharp Corners, Ont., G. H. Brooks; steady in position at least five minutes. Then gradually changed to horizontal . . . . but not drifting with regard to the evening star.

Trenton, Ont., F. Little; did not seem to move from this [first] position.

Summary: no motion observed, 5; to E or SE, 4.

On this, J. R. Weeks, U. S. Weather Bureau, Binghampton, N. Y., says: "During the following ten minutes it gradually faded away without any noticeable changes in shape and without noticeable motion except some broadening. This was considered peculiar, since it would seem that a wind current strong enough to produce the nose-shaped projection toward the east would cause further lengthening of the projection and diffusion of the dust-particles in it . . . since the upper and lower ends of the trail were in a straight line, and the projection was only on the eastern side, it could not mean a twisting in the course of the meteor."

According to the opinion of H. A. Newton, in connection with a meteor of Nov. 14, 1868, zigzag and looped forms of the train of Dec. 29 and similar cases are to be regarded as local accidents, due to the special circumstances of the flight. The lack of motion of the train as a whole, reported at Binghampton, may well be due to a general drift toward Binghampton, such as four observers report, combined with a descent. The approach toward Binghampton would have amounted to ten miles out of eighty-six total distance during the ten minutes of observation there, if we assume such a speed as Prof. Newton computed. This would have produced an appreciable perspective broadening, to say nothing of the internal spreading of the cloud. Lancaster and Roslindale are a long way off, and unfavorably placed for observing an easterly motion. Sharp Corners and Trenton, Ont., on the contrary, are well placed. The observer reporting from Trenton does not tell with what he compared the position of the train. The observer at Sharp Corners compares with the evening star, and does note a very considerable change in position, from vertical to horizontal, so that there was a large relative drift, easterly or westerly, not determined in sign by this report. On the whole, it is safe to assume that the positive statements of eastward drift are correct, and that the negative reports are due to combined drift and descent, to observers' distances, or to incomplete description.

We have evidence, then, that, on Dec. 29, 1925, at a height between 40 and 64 miles, there was a strong easterly current of air, of speed undetermined, but much greater in the upper part, perhaps westerly in the lower parts.

As to the descent of meteor trains, Prof. C. C. Trowbridge asserts that the train described by H. A. Newton is the only case of descent known, and that descending trains can only be due to descending air currents.

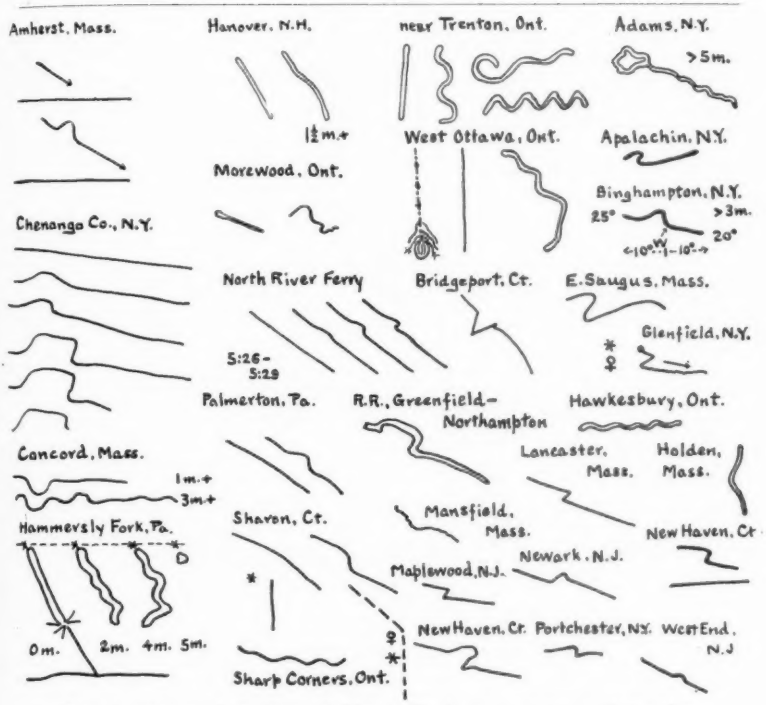


FIG. 4. Forms of the Hornell Meteor Train, seen at many view points, Dec. 29, 1925.

SKETCHES OF SUCCESSIVE STAGES.

Amherst, Mass., M. O. Lanphear.
Chenango Co., P. J. Slate.
Concord, Mass., Dr. W. B. Bartlett.
Hammersly Fork, Pa., H. M. Cranmer.
Hanover, N. H., B. MacKaye.
Morewood, Ont., E. J. Snirle.
N. Y. Harbor Ferry, W. M. Mooney.
Palmerton, Pa., H. M. Cyr.
Sharon, Ct., Mrs. C. W. Bassett.
Sharp Corners, Ont., G. H. Brooks.
Near Trenton, Ont., F. Little.
W. Ottawa, Ont., Rev. J. A. Bradford.

SKETCHES OF SINGLE PHASES.

Adams, N. Y., H. W. Parker.
Apalachin, N. Y., F. J. Hickey.
Binghampton, N. Y., J. R. Weeks.
Bridgeport, Ct., H. R. Sargent.
E. Saugus, Mass., A. H. Unsworth.
Glenfield, N. Y., Mrs. F. G. Bates.
R. R., Greenfield-Northampton, Mass., H. A. Germain.
Hawkesbury, Ont., H. Gourley.
Holden, Mass., W. W. Gleason.
Lancaster, Mass., Miss G. W. Quincy.
Mansfield, Mass., F. S. Boltz.
Maplewood, N. J., J. E. Lambly.
Newark, N. J., R. F. Haulenbeck.
New Haven, Ct., D. H. Wenrich.
New Haven, Ct., D. M. Hetler.
Portchester, N. Y., W. C. Thorne.
West End, N. J., L. Mayer.

Figure 4 shows sketches of the train of the Hornell meteor, traced or copied by hand by the writer and changed in size to fit the page. They are arranged in groups; at the left, sketches of consecutive stages; on the right, sketches of single phases. The order in each group is by names of places, roughly alphabetical.

The variations in these sketches are due (barring lack of skill) first,

to the fact that they were all made from memory a day or more after the observations, and that the observations were made, not with focussed attention, and with no expectation of making sketches or descriptions; second, to the fact that the stages sketched were different; third, to perspective, due to differences in the view points.

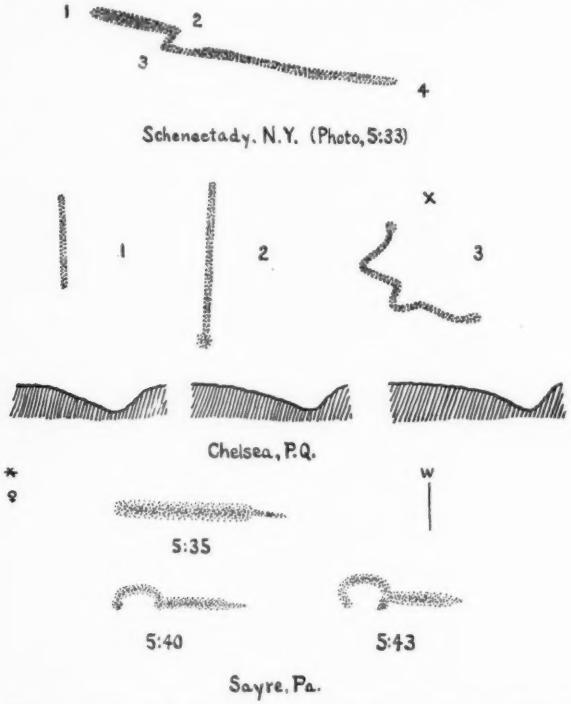


FIG. 5. Forms of the Hornell Meteor Train, from photograph and sketches, and of the Johnstown Meteor Train, Dec. 29, 1925.

No doubt differences in recollection account for the failure to agree of Hammersly Fork 3 and West Ottawa 3; these look very much alike, but they should be mutually mirror images, nearly. Perspective differences are illustrated by Sharp Corners and Glenfield, with Venus in the first on the right, in the second on the left. The Canadian sketches also show perspective differences in apparent inclination of the straight initial train, and a very interesting change from a nearly vertical straight form to a wavy horizontal one. These Canadian sketches and descriptions are essential to any interpretation of the phenomena, and they illustrate the value of getting very numerous reports from the whole area about a fireball path.

Figure 5 shows hand copied reproductions of the photograph of

D. O. Woodbury, at Schenectady, N. Y., of the water color sketches of Rev. E. Geoffrey May, at Chelsea, Quebec, both of the Hornell fireball train, etc., and of the crayon sketches of the Johnstown fireball train, by Percy Reeves and Mrs. Reeves, made at Sayre, Pa. All of these were copied to scale, but are reduced to fit the page.

Mr. Woodbury's photograph is reproduced from measurements. From his description, it would seem that the exposure was from 5:33 to 5:35, with some uncertainty on account of the watch. The train is two or three centimeters from the end of a 3x5⅜-inch Kodak film, and about one centimeter out from the long axis. Nothing else shows except a distant hill horizon and two much nearer trees, all silhouetted against the dying glow of the evening twilight, and very ill-defined and fuzzy. The lens was used wide open, f/7.7, the focussing was necessarily hasty, and the camera was held against a piazza pillar during the two minutes. The presence of the trees made it seem as if some sort of measurement might be attempted, and Mr. Woodbury was so good as to make two more exposures. One was of a measured length of the eaves of a small garage, at a measured distance from the lens, to get the infinity focal length. This came out 142.3 mm. The other was of the original landscape, but just before sunset, with the sun (in haze) in the field, and a long plumbline hung in the foreground, to give the vertical. This was exposed at a noted moment, watch checked by telephone from Western Union Telegraph Office.

Assuming Schenectady as W 73° 56′.6, N 42° 49′, at the moment 1926 Feb. 20^{d} 05^{h} 07^{m} 10^{s} PM, EST, the sun's position was, N 108° 38′ W, +3° 44′ true, +3° 57′ refracted. The barometer and thermometer were estimated from weather maps, 30.0 in, +10° F. By a plan of measurement used by the writer, for which space will not be taken here, the following results were obtained:

Treetop (x in Figure 5) N of sun, 6° 40′, whence azimuth of treetop = N 101° 58′ W; treetop higher than refracted sun, 2° 28′, whence altitude of treetop = 6° 25′. The angular distances of four points on the train image from the treetop were measured. These were reduced to differences of altitude and azimuth by laying the negative on millimeter paper, with the run of the branches hazily indicating the vertical, and so getting values proportional to sine and cosine. This method is rough, but nothing theoretically better would be worth the extra trouble. Whence the positions of these points:

(1) N 106° 02′ W, +8° 38′, upper end.
(2) N 104° 50′ W, +8° 19′.
(3) N 105° 10′ W, +8° 12′.
(4) N 102° 25′ W, +7° 59′, lower end.

These are probably accurate to about ¼°. On account of fuzziness, drift, and great distortion during the six or more minutes since the meteor's flight, they cannot be used to determine points on the meteor's path. The train is shorter than a line connecting the end points of the path would be, as seen from Schenectady, which is to be expected of a red and indistinct object, none too well lighted. The positions may be

compared with compass measurements made at Schenectady, of the general direction of the train, but at uncertain moments.

C. E. Jennings	due west	= N 103° W, true.
D. O. Woodbury	due west ±10°	= N 103° W, true.

It is surprising and unfortunate that, in these days of unlimited amateur photography, only one person had the initiative to get a photograph of this train. Mr. Woodbury's photograph was got under entirely untried conditions as to light and exposure; the writer does not know that a measurable photograph of a meteor train was ever made before. With another as good as this, made anywhere north or south of the train, measurement would have given by far the best determination of a meteor train ever made.

Acknowledgements for assistance in procuring the data, and otherwise, are due to Dr. Harlow Shapley, Director of Harvard Observatory, at whose suggestion the attempt was made and through whose influence coöperation was secured; to the Bureau of Publicity of Harvard University, and to the Associated Press, for spreading questionnaires through the newspapers; to Station WEEI, for reaching the radio audience with questionnaires; and to Director R. Meldrum Stewart, of the Dominion Observatory, Ottawa, for turning over the reports collected by that observatory, reports which have proved essential in unravelling what at first looked like a very tangled mass of data. Suitable acknowledgements cannot be made to the numerous persons scattered over the northeastern United States and Canada who have supplied the fundamental information, through about four hundred original reports and in many cases by additional statements.

The work was done under the auspices of the National Academy of Sciences, by a grant from the J. Lawrence Smith Fund.

NAVAL OBSERVATORY ECLIPSE EXPEDITION TO SUMATRA.

By F. B. LITTELL.

[Communicated by Captain Edwin T. Pollock, U. S. Navy, Superintendent.]

The Naval Observatory eclipse expedition to Sumatra comprising Captain F. B. Littell, Math. C., U. S. N., Associate Astronomer G. H. Peters and Assistant Astronomer G. M. Raynsford of the Naval Observatory, Lieut. H. C. Kellers, M. C., U. S. N., representing the Smithsonian Institution, and Dr. J. A. Anderson, of the Mt. Wilson Observatory, sailed from San Francisco on September 1, 1925, on the U. S. Navy Transport *Chaumont*, for Manila. From Manila the U. S. Navy Mine Sweeper *Bittern* took the party to Palembang, Sumatra, stopping at Java on the way, where a visit was made to the Bosscha Observatory in Lembang. Final arrangements for entry into Sumatra and for transportation across the island were made with Director Vouté of the Observatory and Mr. Kerkhoven, Secretary of the Nederland-

Indische Astronomical Society, who had charge of the matter. The American consul at Batavia, Mr. C. L. Hoover, rendered much valuable assistance in the preliminary arrangements.

On October 19, after a half day of picturesque steaming up the broad and swiftly flowing Moesi River, whose banks in many places were lined with the floating houses so largely preferred by the natives of this region as homes, the *Bittern* dropped anchor at Palembang, the metropolis of southeastern Sumatra.

The Dutch officials of the Residency and the few Americans connected with the Standard Oil organization there warmly welcomed the expedition, and did much to facilitate the movement to the other side of the island. The railroad extended only about halfway and the longer and more arduous part of the journey, and hauling, was by automobile and auto truck over the mountainous region of the West Coast. All this service is owned by the government, and all the transportation of eclipse parties was free, a most welcome and generous exhibition of the interest taken by the Netherlands government in scientific enterprises.

From preliminary reports the Naval Observatory party had decided to locate at Kepahiang or Tebing Tinggi unless some other nearby place should be found to offer superior advantages. Tebing Tinggi was visited on the way to Kepahiang, and while it seemed a very desirable location, the weather chances seemed to be a little better toward the west, and as Kepahiang proved to be a very attractive village, in a beautiful valley rather high up in the mountains of the West Coast, the location was made there. Its elevation was 1700 feet above the sea, and the town clustered around a flat triangular grass-covered esplanade, five or six acres in extent, called the "Aloon-aloon." The site of the eclipse station was eventually located on the western side of this public space, and living quarters were secured in close proximity. There were about a dozen Europeans in the village, a few Chinese, mostly merchants, and several hundred Malays.

As there were seven enlisted men accompanying the expedition, all the work of erection was done by them, under the direction principally of Mr. Raynsford. The construction of the tower, tube, and dark-room for the 65-foot camera pointing directly at the sun when eclipsed, was the time-consuming work of preparation. However, there was plenty of time, even with the interruptions incident to the rainy season, and all the apparatus was in position, and well tested in good time. Dr. Vouté loaned the expedition a radio receiving set with which time signals from Malabar, Manila, and Nauen were received with considerable regularity, and these were of great assistance.

The program of observations included short and extended exposures with the 65-foot camera for details of the structure of the inner corona, prominences, etc., exposures of varying times with the 110-inch and 46-inch cameras on the large polar axis, and exposures of long duration on the 33-inch camera on the small polar axis for extension of the corona. Mr. Peters was in general charge of the photographic work,

and especially in charge of the 65-foot camera during the eclipse. Mr. Raynsford was in charge of the 110-inch and 46-inch cameras, and Lieut. Kellers of the 33-inch during the eclipse.

For the spectroscopic work there were two spectrographs using 8-inch and 6-inch gratings respectively, and a prismatic spectrograph, the objectives being the flash, chromosphere, and coronal spectra. Dr. Anderson was in charge of this work.

There was a small equatorial telescope for observing the contact times, and a moving picture camera for photographing the general features of the eclipse. For this a lens of 17 inches focal length had been adapted by Chief Photographer Brauer, U. S. N., who was in charge of it.

The weather was fairly promising until towards the end of November when the rainy season set in, but from then until the middle of January the percentage of cloudy weather at eclipse time of day was very disconcerting. The residents of the vicinity, however, thought that the chance of having a week or so of good weather in the midst of the rainy season was a good one. And in fact there was such a spell beginning on January 9, and ending January 16. During this week of comparatively good weather, eclipse day proved to be a tantalizing one. At times the outlook seemed hopeless, and at other times the prospect seemed very bright. At 11:00 A. M. it looked so bad that the movie operator was sent away in an automobile to look for a less cloudy location. An hour later, it was thought that a mistake had been made in sending him away, so surely did it appear then that we should have clear sky. Totality was to begin at 2:35:04 P. M., 255th meridian time, and was to end at 2:38:12. At 1:30 there was a sun shower. At 2:15 the sun was in a large clear area which all thought would last through the eclipse, but at 2:25 a thick cloud passed in front of the sun, and at 2:35 the sun was invisible and all operations were begun on chronometer schedule time. Two minutes later the eclipsed sun became visible through rifts in the clouds, and this condition continued until 2:41 when again the partially eclipsed sun shone beautifully in a large area of clear sky. During the moments of partial visibility the program of observations had been going on as planned, or as modified by the judgment of the observers in view of the circumstances.

Several excellent photographs of the inner corona were secured with the 65-foot, the 110-inch, and 46-inch cameras. Those taken for extension were not so good as the light that came through the cloud was not strong enough to bring out the fainter regions of the corona. For the same reason the spectrographic plates did not show any but the very strong lines.

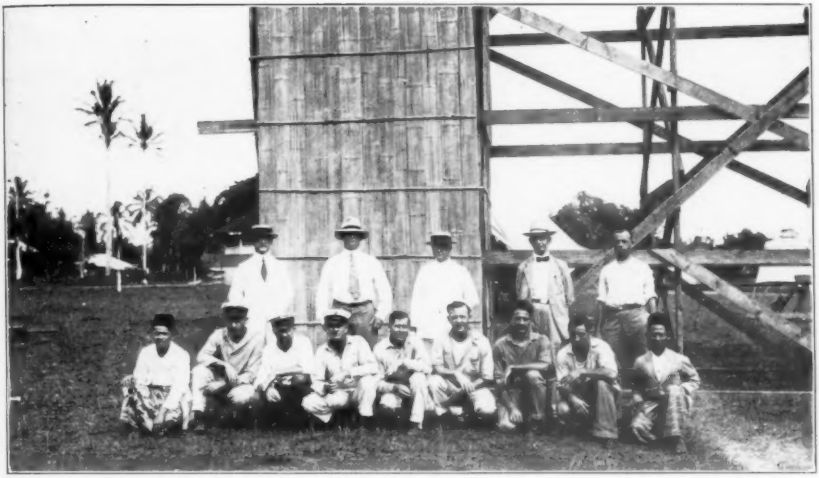
The contacts were observed as follows, Greenwich Time:

	Computed	Littell	Raynsford
	h m s	h m s	h m s
I	6 4 38.	6 5 10.	6 5 4
II	7 35 3.8		
III	7 38 12.3	7 38 13.7	
IV	8 55 37.	8 55 36.	8 55 30

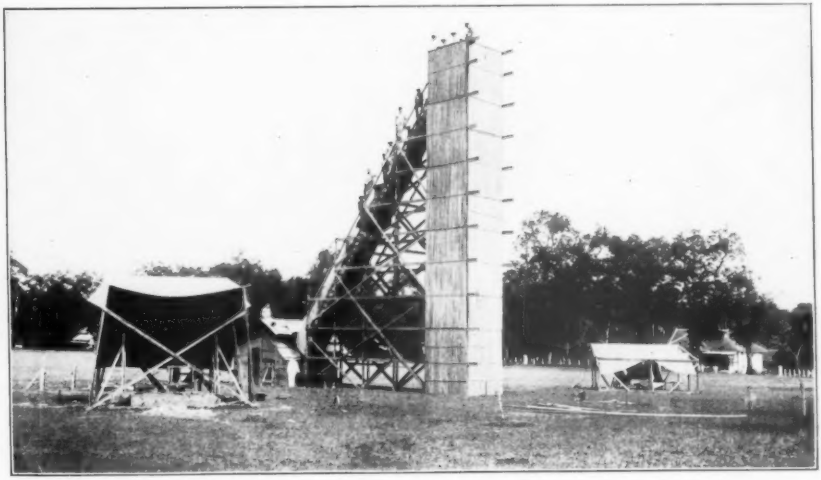
PLATE XX

Corona taken by G. H. Peters, Associate Astronomer, U. S. Naval Observatory, with 65-ft. focal length camera. Naval Observatory, Kepahiang, Sumatra, 1926. (About one-third size of original plate.)

PLATE XXI



GROUP OF ASTRONOMERS, SAILORS, AND MALAY ASSISTANTS
at the total Solar Eclipse, January 14, 1926, Kepahiang, Sumatra. Back row (left to right) F. B. Littell, H. C. Kellers, G. H. Peters, J. A. Anderson, G. M. Raynsford. Front row (left to right) Ali, Mandour, D. J. Wright, Bensinger, Breen, Kratzer, McCarty, E. C. Brauer, Peterson, Abdul.



GENERAL VIEW OF U. S. NAVAL OBSERVATORY ECLIPSE STATION
January 14, 1926, Kepahiang, Sumatra.

With the assistance of the ever-helpful Controleur of the Redjang District, Mr. Wink, the movie operator, Mr. Brauer, was fortunate in finding a good place at Taba Penandjoeng, about 15 miles from Kepahiang, towards Benkoelen, where he succeeded in securing good pictures of the partial and total phases of the eclipse. Mr. Wink also made an excellent drawing of the corona.

In addition to his eclipse duties, Dr. Kellers was commissioned to make zoological and entomological collections for the Smithsonian Institution. In this he was so industrious and he succeeded in arousing such an enthusiasm for collecting among the natives that he was enabled to bring back 9000 specimens, most of them preserved, but some alive, including a 16-foot python and a number of birds.

REPORT ON MARS, NO. 37.

By WILLIAM H. PICKERING.

Martian Longitudes. Period of Rotation.

In our Report No. **35** we recorded the fact that in the map of Thaumasia by M. Antoniadi, while his latitudes agreed well with ours, his longitudes were materially higher. He states also in his accompanying article that the longitudes given in the *American Ephemeris* are about 4° too high. In our earlier work on the planet, we determined the longitude of each drawing by taking the mean of the times of the beginning and ending of the representation of the outlines of the main features of the disk. When we began computing the longitudes for our table in Report No. **33**, and compared them with the longitudes determined by taking the time of transit of the markings across the central meridian, we found that the former were between 3° and 4° too high. It then became evident that instead of taking the mean time of the drawing, we should have taken the time of its beginning, when the position of the most conspicuous details were recorded and from which the others were located. The table was computed on this principle, and the results were found to be in accordance with those determined from the transits. Measures of an artificial disk showed that the transits gave a nearly unbiased result.

While the average deviation in longitude of a single drawing based on the 24 points in class **A** amounts to ±2°.56, the average deviation of a single transit determined by means of 10 points measured in 1924 was only ±0°.54. This is however hardly a fair comparison, since it is possible to secure several times as many independent drawings of a given point in the course of an apparition as we can secure transits. The transit method is, however, undoubtedly the best for determining if any point on the planet is really stationary throughout its year, and if such is the case for determining its longitude as a standard of refer-

ence. Comparing our results by the transit method with those of Schiaparelli made fifty years previously, after allowing for the change made in the ephemeris by Marth in 1896, we find that the universally adopted period is surprisingly accurate, and that no correction to the longitudes will be necessary for very many years to come. It is hoped to publish a detailed description of our studies of our measures of transits in a future report. It is regrettable that no equally accurate method of measuring latitudes is available.

Were I asked to name the two points which are most likely to prove stationary in longitude on the planet, I would say that as a result of my uncompleted studies I should recommend the northern point of the preceding Furca and Titanum. Both of these points are concealed at certain times, but at identical Martian dates their positions should be identical. It is very desirable to know if any lake is stationary in both latitude and longitude. The evidence so far goes to show that both Ismenius and Phoenicis move a little short of 200 miles in the course of the year. Oxia may be stationary, though a shift in longitude is suspected. The most conspicuous remaining lakes are Maeisia, the two Juventae, Sirbonis, Juturna, and Coloe. The latter name is as originally given by Lowell, and shown on my map, Report No. **36**. Antoniadi applied it to another and much larger formation. Standard longitudes should necessarily be located near the equator. Large systematic errors may occur when the points transit far from the center of the disk. A comparatively small telescope, not exceeding 5 inches aperture, if provided with a position circle, might serve for these measures, and since many of them are available, it is hoped that some measures may be secured this year. Latitudes should also be determined either with the micrometer, or by the method described in Report No. **22**, under the heading Shifting Surface Detail.

A Comparison of the Drawings of 1924.

Turning now to these drawings, the two which are most conspicuously unlike in Report No. **34** are probably Figures 22 and 24 by Messrs. Hamilton and Trumpler. This is largely because both show a great deal of minute detail in the center, and it is in this detail that they differ. In the larger and easier detail around the circumference they strongly resemble one another. The only other drawing capable of showing this central detail in either Report is Figure 21 by the writer. In this particular drawing I unfortunately located Hellas too far to the south, not only as compared with the drawings of the other observers, but also as compared with my own other unpublished drawings. This rather distorts the central area but allowing for this defect the drawing supports Trumpler rather than Hamilton. This is interesting because Hamilton and I used the same 11-inch telescope. Nevertheless this does not necessarily prove that Hamilton's drawing is wrong. It is possible that none of us represented the detail as it really existed on the planet. It was undoubtedly very difficult. The draw-

ings merely show that that particular detail affected Trumpler and myself alike. Hamilton made eight drawings of the region at that presentation, four of which, made on as many different nights, were confirmatory of his canal system. Nevertheless I could not confirm his detail, nor he mine, although each knew at the time what the other was drawing. Hamilton's drawings generally represent the lakes as smaller than Trumpler's, but we all agree as to the width of the canals. Hamilton and I agree as to the northern boundary of the region; Hamilton and Trumpler agree as to the southern.

A little more than a dozen years ago some of the more conservative sidereal astronomers, rejecting Schiaparelli's work as worthless, and judging by what they could see themselves, did not believe that much of any detail was ever visible upon Mars excepting the snow caps, and possibly the Syrtis major. We have now fortunately passed beyond that stage, but missionary work is still very necessary, witness the skepticism even at the present time regarding the existence of the canals. The importance of having an international society through which drawings from all over the world can be compared is evident. Persons unfamiliar with astronomy on being shown the drawings, however, instead of seeing their resemblances, frequently remark "Why how different they all are." They seem to suppose that all the finer detail is as easily seen on the planet as it is in the drawings, and that all the observer has to do is to draw it. They do not realize that at the spring oppositions we never see the planet, no matter what magnification we may employ, any better than we do the full moon with the naked eye. The moon as we know appears no bigger than the end of a lead pencil held at arm's length. In 1924 the planet appeared almost twice as large, so that we saw more; nevertheless the finer detail, when it happens that there is no general agreement among the observers, must always remain uncertain.

Figures 17, 18, 19, and 20, of Report No. **34**, and Figure 41 of Report No. **35** make another interesting study. Hamilton in Figure 18 draws two straight and parallel canals Aethiops and Amenthes-Thoth, but extends them from the snow cap itself to near the northern edge of the disk. As is his custom he draws them very narrow. As to their shape and position, Douglass confirms him, but Douglass represents both the canals as is his custom very wide, especially near the snow. As to their width I agree with Douglass, but I shift the northern left hand canal slightly to the left, while Wilson on the other hand shifts it somewhat to the right, and Trumpler disagrees with all the others in not drawing the canals parallel. The detail and shape of his right hand canal however almost exactly agree with mine, although he draws also a faint cut-off which would straighten the canal somewhat like Hamilton's. In a drawing recently received from our fellow associate Mr. Attkins, made in Madeira September 2, 1924, with an 8.5-inch mirror, ω 260°, he draws the right hand member in close agreement with Trumpler and myself, but makes it almost as narrow as Hamilton's.

We thus see how all the drawings differ from one another in detail while resembling one another in their main features. The majority of opinion seems to be that the two canals are nearly parallel and nearly straight for fully 4000 miles, but are not exactly so.

If parallel, the canals obviously could not both be arcs of great circles, but it was felt that the right hand one was nearly enough so to enable us to try an interesting experiment. Any great circle in passing the center of the disk must necessarily appear as a straight line. Away from the center it would appear as an arc of an ellipse. The plan was to see how long such a canal would appear straight on either side of the center. We could thus determine how long the radius of curvature of a curved canal would have to be in order that it might be mistaken on the central meridian for a great circle. Unfortunately the weather did not permit this idea to be carried out, but on a drawing made on October 19 at central meridian ω 270°.3 Amenthes-Thoth was markedly curved in one direction, and on the next night at ω 238°.9, 32° earlier, it was equally curved in the other. It appeared reasonably certain that its curvature could have been detected, if looked for, when its middle was within 8° of the central meridian. This corresponds to a radius of 12,000 miles. Any long canal which appears straight when on the central meridian must therefore have a radius of curvature of at least 12,000 miles. Observations of the apparent curvature near transit of a seemingly straight canal would furnish a delicate test as to its real straightness. On October 20 Hamilton saw a light streak of cloud between Aethiops and Amenthes, and parallel to them. These two canals were last seen in 1922 at ⊙ 264°.7, which would fall on August 16 this year, diameter of the planet 12″.9, but in 1924 they were traced until ⊙ 302°.0, which would fall this year on October 16, when the planet is near its maximum size. They form an interesting feature as we shall presently see, and should therefore be carefully observed.

The Canals Calydon and Number 15.

In the various drawings of Thaumasia, published in Report No. **35**, there is a curious lack of agreement among the observers with regard to these two canals (see Figure 50) which is not found in the other cases. Some observers appear to have drawn one, some the other (compare Figures 31, 32, 34 as to their northern ends), while in Report No. **34** both are represented, but 15 very faintly by Hamilton. Since in the latter case only one observer saw 15, while all of them saw Calydon, it was assumed that the European and Asiatic observers had all attempted to draw Calydon, and that some of them had depicted it rather badly. A further investigation, however, based in part on the unpublished Jamaica drawings, particularly those of Mr. Hamilton who made a special study of this formation, shows that this was not the case. Indeed considering the small apertures with which some of these observers were obliged to work, it now appears that their drawings are rather surprisingly accurate. In Table I the unpublished Jamaica draw-

ings are discussed, together with those of all the other observers, published and unpublished, excepting those who used the four largest telescopes, those ranging from 28 to 100 inches in diameter. The work of these observers unfortunately had to be omitted, because none of them were able to see either of these canals.

According to the observations of 1922, Report No. 29, no one saw number 15. I saw Calydon clearly several times, and Maggini saw a canal between it and number 15, perhaps intended for the former. In Table I the first column gives the dates of all the available drawings for 1924 which show these two canals, 50 in all. The names of the observers are given in the second column, the diameter of the planet in the third, the drawings which show Calydon in the fourth, and those which show 15 in the last. Hamilton drew Calydon on June 11, ⊙ 197°.2, and it was next detected by Schofield on August 5, no one seeing it in

TABLE I.

THE CANALS CALYDON AND NUMBER 15.

1924		Observer	Diam.	Cal.	15
May	10	Pickering	10″.6		×
	10	Pickering	10.6		×
June	10	Hamilton	14.2		×
	11	Hamilton	14.3	×	×
	13	Hamilton	14.6		×
	13	Hamilton	14.6		×
July	13	Phillips[1]	19.8		×
	15	Hamilton	20.2		×
	16	Hamilton	20.4		×
	18	Pickering	20.8		×
Aug.	5	Schofield	23.8	×	
	8	Nakamura	24.2	×	
	12	Phillips[1,2]	24.6		×
	13	Wilson	24.7		×
	15	DuMartheray[3]	24.9		×
	16	Schaer[3]	24.9		×
	19	Hamilton	25.1		×
	21	Pickering	25.1	×	
	21	Wilson[4]	25.1	×	
	22	Hamilton[4]	25.1		×
	22	Wilson	25.1		×
	23	Hamilton	25.1	×	×
	24	Hamilton	25.1	×	×
	24	Hamilton	25.1		×
	25	Hamilton	25.1	×	×
Aug.	26	Hamilton[4]	25″.0	×	×
	27	Hamilton	25.0		×
	27	Wilson[4]	25.0	×	
	29	Douglass	24.9	×	
	29	Trumpler[4]	24.9	×	
	29	Wilson	24.9	×	
Sept.	6	Nakamura[2]	24.1		×
	7	Nakamura[2]	24.0		×
	10	Ellison	23.5	×	
	14	Ellison[2]	22.9		×
	15	Ellison	22.7		×
	17	Phillips[1]	22.3		×
	22	Pickering[4]	21.4	×	
	28	Hamilton	20.2		×
Oct.	1	Hamilton	19.6	×	×
	1	Hamilton	19.6	×	×
	3	Hamilton	19.2	×	
	13	Schofield[2]	17.3	×	
	14	Nakamura	17.2	×	
	14	Ellison	17.2	×	
	18	Ellison	16.4	×	
	29	Pickering	14.6	×	
	30	Hamilton	14.5	×	
Nov.	1	Hamilton	14.2	×	
	8	Hamilton	13.2	×	

[1] M. N. Dec. 1924.
[2] Report on Mars No. 34.
[3] Archives Sci. Phys. Nat. Geneva, March, April 1925.
[4] Report on Mars No. 35.

The remaining drawings are unpublished.

July. Two weeks later it became frequently visible and continued so until the planet was too remote to follow it farther, ⊙ 290°.7. On the other hand 15 was visible as soon as the planet was near enough to us, ⊙ 178°.6. but was last seen upon October 1, ⊙ 267°.2. We have thus witnessed both the formation and the disappearance of a Thaumasian canal. Both canals were visible at times between August 5 and October 1. Six observers saw Calydon, and eight saw 15, the total number in-

cluding all of our eight observers, and Messrs. Phillips, Du Martheray, and Schaer. When these results were tabulated it appeared at once that there was a sort of alternation in visibility between the two canals. A plot (Figure 1) was therefore constructed, beginning with August 20, and ending with October 4.

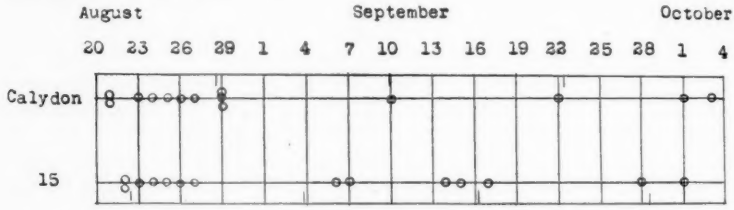


Figure 1

In the latter part of August the polar cap was melting very rapidly, and Hamilton frequently included both canals in the same drawing. After that, however, they seemed to alternate in a period of about twelve Martian days. The observations were too few to give very satisfactory results, and when both canals were included on the same drawing it was unfortunately impossible to judge which of the two was the more conspicuous. The observations are represented by the small circles, and the period of twelve days is indicated by the short vertical lines. It is clear that if this period is genuine, it could only be discovered by an international society working in many different terrestrial longitudes, so as to keep the planet under constant inspection. Those who doubt if the planet supports intelligent life will say that the coincidence with this period is accidental, and due perhaps to lack of observations, or to Martian clouds which hid these canals alternately. Those who believe in intelligent life on the planet may suggest that as the supply of water diminished, only crops which were as quick growing as our mushrooms were alternately planted or watered.

It appears clearly to me, however, that until the phenomenon has been repeated several times more, and also been more completely recorded, it is safest to attribute it to drifting Martian clouds. Finally I may suggest that should either of these two canals, particularly number 15, appear again during the coming apparition, in August, September, or October, no opportunity to observe it should be neglected, and that the writer should be notified. It is also requested that observers who possess drawings made in 1924, particularly in September, which show either of these canals, but which are not mentioned in Table I, should inform the writer giving their dates. I wish to acknowledge here a series of seven additional observations of the canals Calydon and number 15 kindly sent me by Dr. Trumpler, and a large number of drawings, twelve showing Calydon and four showing number 15 sent by Mr. Wilson at my request, but which arrived too late to be included in the Table or Figure. They all confirm the previous results, but confine

the period of alternating appearance to the interval between August 29 and September 25. An observation of number 15 on September 2 by Dr. Trumpler and two of Calydon by Mr. Wilson on September 23 and 25 are of particular interest.

So many persons habitually draw the canals too narrow, that it may be well here to make the following simple suggestion to them. Suppose that you have two conspicuous canals near one another and nearly parallel, and suppose you have drawn them of the width that you think is correct. Now check your result by seeing if the ratio of the breadth of each canal on the drawing to the breadth of the space between them, is the same as the ratio of these same quantities on the planet. The idea is simple and obvious when stated, but from the drawings often handed in to me I think this precaution is frequently neglected. In a recent publication I find it stated that I had said that it was both useless and undesirable to look for fine planetary detail on Mars. It is, I trust, hardly necessary for me to deny that I ever made such a silly statement. I was simply misunderstood. What I did say and insisted upon was the great importance of drawing the exact shape of the more important detail with all possible care, and of not neglecting it, as several prominent observers have done in the past, for the sake of devoting most of their time to searching for fine canals. I pointed out that on Mars, unlike the earth, the main features are constantly shifting their outlines, and since they are better seen than the others, more could be learned from their study. Any fine detail that can certainly be seen should of course be drawn, but for anyone to cover the surface of the planet with a mass of imaginary detail, either canals or lakes, which they only think they can see does far more harm than good.

(To be continued.)

PLANET NOTES FOR SEPTEMBER AND OCTOBER.

The *Sun*, during these two months, will move southeastwardly from Leo into Virgo. It will move across Virgo and will be very near the boundary between Virgo and Libra at the end of October. At the middle of October it will be very near the bright star Spica. Its center will be within two degrees of this bright star when nearest to it. The sun will cross the equator from north to south at noon, C. S. T., on September 23. At the end of October it will be nearly 14° south of the equator.

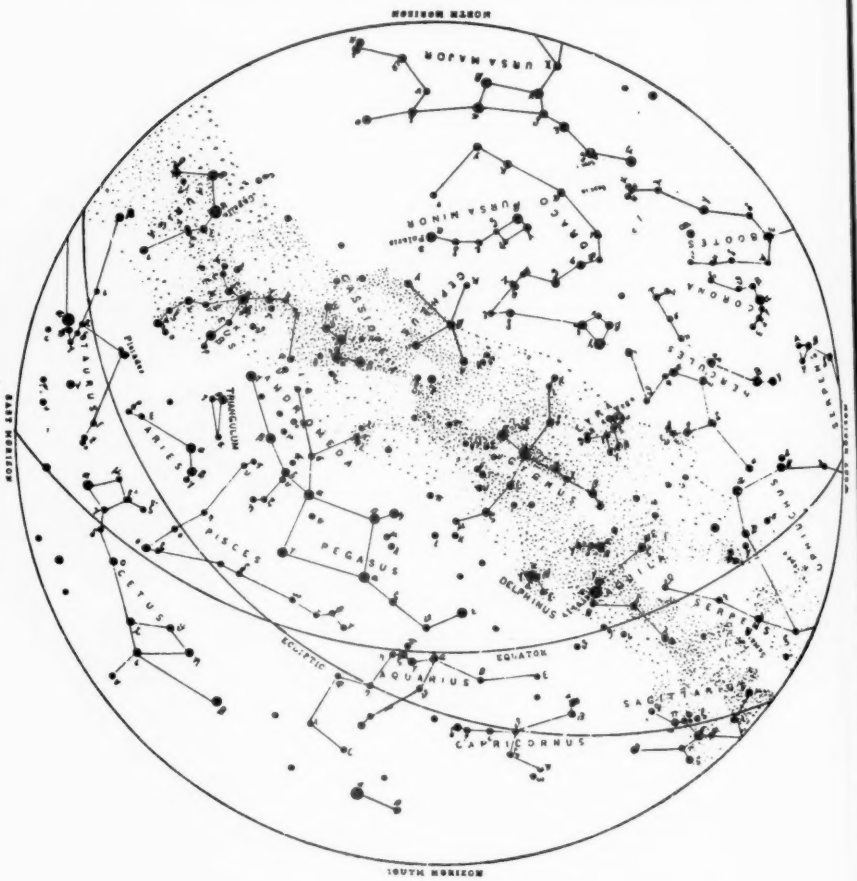
The phases of the *Moon* for these months will occur as follows:

New Moon	Sept.	7	at 0 A.M.	C.S.T.
First Quarter		14	" 10 P.M.	"
Full Moon		21	" 2 P.M.	"
Last Quarter		28	" 12 M.	"
New Moon	Oct.	6	at 4 P.M.	C.S.T.
First Quarter		14	" 2 P.M.	"
Full Moon		20	" 11 P.M.	"
Last Quarter		28	" 5 A.M.	"

The moon will be farthest from the earth on September 6 and on October 4;

it will be nearest to the earth on September 21 and on October 19.

Mercury, having reached a point of greatest elongation west of the sun on August 25, will be moving eastward more rapidly than the sun throughout these two months. It will pass superior conjunction on September 19, and will be



THE CONSTELLATIONS AT 9:00 P. M. OCTOBER 1.

near a point of greatest elongation east at the end of October. This planet will therefore be too near the sun to be visible at all during this period. It will be northwest of the sun at the beginning of September and southeast of the sun at the end of October.

Venus will be moving eastward a little more rapidly than the sun. At the beginning of September it will be very near the eastern horizon at sunrise, and after a few days it will be too near the sun to be seen. It will remain hidden in

the rays of the sun throughout this period. It will, however, not reach superior conjunction until after the middle of November.

Mars will be in favorable position for observation during these months. At the beginning of the period it will cross the meridian at 4 A. M., and at the end at midnight. At the end of October it will be near a point of opposition, and on October 27 it will be nearest the earth for this opposition. This, however, will not be a close approach; the distance between Mars and the earth will be about 85,000,000 miles.

Jupiter, having passed opposition about the middle of August, will be a brilliant object in the sky. It will be rather far south for northern observers. Its motion will be retrograde until October 15. It will be in the eastern part of the constellation Capricornus.

Saturn will be easily visible in the early evening during September. During the early part of October it will be rather low in the west at sunset. At the end of October it will be too near the sun to be visible. It will be in the eastern part of Libra.

Uranus will be in the constellation Pisces. It will be at opposition on September 21. On October 1 it will cross the meridian a little after eleven o'clock at night.

Neptune will again be becoming visible in the early morning just before sunrise. It will be in the eastern part of Leo, near the bright star Regulus.

Occultations Visible at Washington.

[From the *American Ephemeris.*]

Date 1926	Star's Name	Magnitude	IMMERSION. Washington C.T.	Angle from N	EMERSION. Washington C.T.	Angle from N	Duration
			h m	°	h m	°	h m
Sept. 21	336 B. Aquarii	6.3	0 7	124	0 37	173	0 30
23	117 G. Piscium	6.5	3 6	21	4 2	278	0 56
26	193 B. Tauri	6.2	1 32	102	2 35	209	1 3
27	333 B. Tauri	6.3	0 9	130	0 43	192	0 34
27	*l* Tauri	5.2	1 32	28	2 27	293	0 55
28	14 B.Geminorum	6.0	4 58	77	6 27	270	1 30
29	44 Geminorum	5.9	5 45	48	6 53	313	1 8
Oct. 1	39 Cancri	6.5	0 22	81	1 15	284	0 53
1	40 Cancri	6.5	0 24	89	1 18	276	0 54
14	329 B. Sagittarii	6.1	20 56	91	22 4	238	1 8
14	336 B. Sagittarii	6.5	22 10	94	23 10	235	1 0
15	η Capricorni	4.8	22 58	28	23 46	289	0 49
20	26 Ceti	6.0	4 54	354	5 10	319	0 16
21	85 Ceti	6.3	21 12	4	21 48	298	0 36
27	49 B. Cancri	6.0	22 25	146	22 55	215	0 30

COMET AND ASTEROID NOTES.

Kopff's Comet Rediscovered.—By telegram and later by Harvard College Observatory Announcement Card 4, dated July 15, 1926, we have the following item:

"A cablegram from Professor Strömgren announces the observation of Kopff's periodic comet by Wolf in the following position:

"July 13.0453 U. T., Right Ascension $1^h\ 17^m\ 12^s$, Declination $+18°\ 14'$. Daily motion 1^m east, $9'$ north. Magnitude 16. Harlow Shapley."

Eros (433). – This, perhaps the most interesting of the asteroids, passed a point of opposition on July 8, 1926. It is now receding from the earth and becoming fainter slowly. The following ephemeris, taken from a note by Leland E. Cunningham in H. C. O. Bulletin 836, for August, September, and October, may be of use to observers who are far enough south and have instruments adequate for such a faint object.

EPHEMERIS FOR 0^h U. T. (1926.0).

1926		R. A. h m s	Dec. ° ′ ″	Log r	Log Δ	Mag.
August	5	18 23 35	—26 46 19	0.2504	9.9346	11.5
August	13	18 18 19	—25 32 29	0.2510	9.9631	11.7
August	21	18 16 33	—24 25 5	0.2512	9.9934	11.8
August	29	18 17 53	—23 24 50	0.2512	0.0242	12.0
September	6	18 21 55	—22 31 2	0.2508	0.0546	12.1
September	14	18 28 16	—21 42 15	0.2501	0.0841	12.3
September	22	18 36 33	—20 56 46	0.2490	0.1122	12.4
September	30	18 46 27	—20 12 47	0.2477	0.1387	12.5

VARIABLE STARS.

Maxima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract 5^h; Central Standard time 6^h, etc.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of maxima in 1926							
					Sept.				Oct.			
	h m	° ′		d h	d h	d h	d h	d h	d h	d h	d h	d h
SX Cassiop.	0 05.5	+54 20	8.6— 9.2	36 13.7	28 16							
SY Cassiop.	0 09.8	+57 52	9.3— 9.9	4 01.7	8 15	24 22	3 2	19 9				
RR Ceti	1 27.0	+ 0 50	8.3— 9.0	0 13.3	4 4	19 15	12 21	28 9				
RW Cassiop.	1 30.7	+57 15	8.9—11.0	14 19.2	14 19	29 14	14 10	29 5				
V Arietis	2 09.6	+11 46	8.3— 9.0	0 23.8	9 9	25 6	3 4	19 2				
SU Cassiop.	2 43.0	+68 28	6.5— 7.0	1 22.8	6 21	22 11	8 2	23 16				
RW Camelop.	3 46.2	+58 21	8.2— 9.4	16 00.0	4 3	20 13	6 23	23 8				
SX Persei	4 10.2	+41 27	10.4—11.2	4 07.0	2 13	19 17	6 21	24 1				
SV Persei	42.8	+42 07	8.8— 9.6	11 03.1	5 9	27 15	8 18	31 1				
RX Aurigæ	4 54.5	+39 49	7.2— 8.1	11 15.0	9 15	21 6	2 21	26 4				
SX Aurigæ	5 04.6	+42 02	8.0— 8.7	1 12.8	3 15	18 22	4 6	19 14				
SY Aurigæ	05.5	+42 41	8.4— 9.5	10 03.3	8 19	29 2	9 5	29 11				
Y Aurigæ	21.5	+42 21	8.6— 9.6	3 20.6	9 13	25 0	10 10	25 21				
RZ Gemin.	5 56.6	+22 15	9.1—10.0	5 12.7	7 16	24 6	10 20	21 21				
RS Orionis	6 16.5	+14 44	8.2— 8.9	7 13.6	8 5	23 8	8 12	23 15				
T Monoc.	19.8	+ 7 08	5.7— 6.8	27 00.3	1 9	28 9		25 9				
RT Aurigæ	23.0	+30 33	5.1— 6.0	3 17.5	5 7	20 5	5 3	20 1				
W Gemin.	29.2	+15 24	6.7— 7.5	7 22.0	9 20	25 16	11 11	27 7				
ξ Gemin.	6 58.2	+20 43	3.7— 4.3	10 03.7	3 20	24 4	4 8	24 14				
RU Camelop.	7 10.9	+69 51	8.5— 9.8	22 06.5	10 4		2 11	24 17				
RR Gemin.	7 15.2	+31 04	10.0—11.5	0 09.5	2 15	18 12	4 10	20 7				
V Carinæ	8 26.7	—59 47	7.4— 8.1	6 16.7	2 23	23 1	6 11	19 20				

Maxima of Variable Stars of Short Period—Continued.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of maxima in 1926							
					Sept.				Oct.			
	h m	° ′		d h	d h	d h	d h	d h	d h	d h	d h	d h
T Velorum	8 34.4	−47 01	7.6— 8.5	4 15.3	6 14	25 4	9 2	23 0				
V Velorum	9 19.2	−55 32	7.5— 8.2	4 08.9	1 12	19 0	6 11	23 23				
Z Leonis	9 46.4	+27 22	7.9— 9.6	56 08.7	8 8							
RR Leonis	10 02.1	+24 29	9.1—10.1	0 10.9	7 3	20 17	11 2	24 15				
SU Draconis	11 32.2	+67 53	8.9— 9.6	0 15.8	8 17	21 22	11 17	24 22				
S Muscæ	12 07.4	−69 36	6.4— 7.3	9 15.8	4 22	24 6	3 22	23 5				
SW Draconis	12.8	+70 04	8.8— 9.6	0 13.7	3 8	19 7	5 6	21 5				
T Crucis	15.9	−61 44	6.8— 7.6	6 17.6	4 14	18 2	8 6	21 17				
R Crucis	18.1	−61 04	6.8— 7.9	5 19.8	8 1	19 17	7 4	24 15				
S Crucis	12 48.4	−57 53	6.5— 7.6	4 16.6	9 8	23 9	7 11	21 13				
W Virginis	13 20.9	− 2 52	8.7—10.4	17 06.5	4 23	22 6	9 12	26 18				
SS Hydræ	25.0	−23 08	7.4— 8.1	8 04.8	8 12	24 22	3 3	19 12				
RV Urs. Maj.	13 29.4	+54 31	9.2— 9.9	0 11.2	4 11	18 12	9 13	23 14				
ST Virginis	14 22.5	− 0 27	10.3—11.4	0 09.9	8 12	23 7	8 3	22 23				
V Centauri	25.4	−56 27	6.4— 7.8	5 11.9	7 18	24 6	10 18	21 17				
RS Bootis	29.3	+32 11	8.9—10.0	0 09.1	5 17	20 20	5 22	21 1				
R Trian.Austr.	15 10.8	−66 08	6.7— 7.4	3 09.3	10 18	24 7	7 20	21 10				
S Trian.Austr.	15 52.2	−63 29	6.4— 7.4	6 07.8	8 19	21 10	10 10	23 1				
S Normæ	16 10.6	−57 39	6.6— 7.6	9 18.1	3 23	23 11	3 5	22 17				
RW Draconis	33.7	+58 03	9.6—10.8	0 10.6	1 13	19 6	7 0	24 17				
RV Scorpii	16 51.8	−33 27	6.7— 7.4	6 01.5	3 10	21 15	3 18	21 22				
X Sagittarii	17 41.3	−27 48	4.4— 5.0	7 00.3	7 21	21 22	5 22	19 23				
Y Ophiuchi	47.3	− 6 07	6.1— 6.5	17 02.9	12 2	29 5	16 8					
W Sagittarii	17 58.6	−29 35	4.3— 5.1	7 14.3	1 9	16 13	1 18	16 23				
Y Sagittarii	18 15.5	−18 54	5.4— 6.2	5 18.6	11 18	23 7	10 15	22 4				
U Sagittarii	26.0	−19 12	6.5— 7.3	6 17.9	3 19	24 0	7 12	21 [illegible]				
Y Scuti	32.6	− 8 27	8.7— 9.2	10 08.3	1 22	22 14	2 23	23 15				
RZ Lyræ	39.9	+32 42	9.9—11.2	0 12.3	3 10	18 18	11 18	27 3				
RT Scuti	18 44.1	−10 30	9.1— 9.7	0 11.9	3 17	18 14	3 11	18 8				
κ Pavonis	18 46.6	−67 22	3.8— 5.2	9 02.2	8 2	26 7	5 9	23 13				
U Aquilæ	19 24.0	− 7 15	6.2— 6.9	7 00.6	7 10	21 11	5 12	19 13				
XZ Cygni	19 30.4	+56 10	8.6— 9.3	0 11.2	6 4	20 4	11 4	25 4				
U Vulpec.	32.2	+20 07	6.5— 7.6	7 23.5	7 7	23 6	9 5	25 4				
SU Cygni	40.8	+29 01	6.2— 7.0	3 20.3	4 9	19 18	5 3	20 12				
η Aquilæ	47.4	+ 0 45	3.7— 4.5	7 04.2	8 0	22 8	6 17	20 1				
S Sagittæ	51.5	+16 22	5.6— 6.4	8 09.2	7 8	24 2	2 11	19 5				
X Vulpec.	19 53.3	+26 17	9.5—10.5	6 07.7	3 23	22 23	5 14	24 13				
X Cygni	20 39.5	+35 14	6.0— 7.0	16 09.3	15 5		1 14	17 23				
T Vulpec.	47.2	+27 52	5.5— 6.1	4 10.5	7 6	20 13	8 7	21 14				
UY Cygni	52.3	+30 03	9.6—10.4	0 13.5	8 23	23 12	8 2	29 23				
RV Capric.	55.9	−15 37	9.2—10.1	0 10.7	2 22	17 5	8 17	23 1				
TX Cygni	20 56.4	+42 12	8.5— 9.7	14 17.4	4 4	18 21	3 14	18 7				
VY Cygni	21 00.4	+39 34	8.8— 9.5	7 20.6	6 3	21 21	7 14	23 7				
SW Aquarii	10.2	− 0 20	9.9—10.8	0 11.0	7 16	21 11	5 5	25 21				
VZ Cygni	21 47.7	+42 40	8.2— 9.2	4 20.7	7 19	22 9	6 23	26 11				
Y Lacertæ	22 05.2	+50 33	9.1— 9.6	4 07.8	2 19	20 3	7 10	24 17				
δ Cephei	25.5	+57 54	3.7— 4.6	5 08.8	10 7	21 1	7 3	23 5				
Z Lacertæ	36.9	+56 18	8.2— 9.0	10 21.1	1 1	22 20	3 17	25 12				
RR Lacertæ	37.5	+55 55	8.5— 9.2	6 10.1	4 4	23 10	6 6	19 1				
V Lacertæ	44.5	+55 48	8.5— 9.5	4 23.6	6 5	21 4	6 3	26 1				
X Lacertæ	22 45 0	+55 54	8.2— 8.6	5 10.7	11 20	22 17	9 1	25 9				
SW Cassiop.	23 03.7	+58 11	9.2— 9.7	5 10.6	8 11	24 19	5 16	22 0				
RS Cassiop.	32.6	+61 52	9.0—11.0	6 07.1	4 10	23 7	5 22	24 19				
RY Cassiop.	47.2	+58 11	9.3—11.8	12 03.4	10 22	23 2	5 5	29 12				
V Cephei	23 51.7	+82 38	6.0— 7.0	0 23.9	12 12	26 12	10 11	24 10				

Minima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract 5^h; Central Standard time 6^h, etc.

Star	R.A. 1900	Decl. 1900	Magnitude	Approx. Period	Greenwich civil times of minima in 1926							
					Sept.				Oct.			
	h m	° ′		d h	d h		d h		d h		d h	
SY Androm.	0 08.0	+43 09	9.5—13.0	34 21.8			19	16			24	14
RT Sculptor.	31.5	—26 13	9.6—10.5	0 12.3	4	20	20	5	5	13	20	21
U Cephei	0 53.4	+81 20	7.0— 9.0	2 11.8	8	16	23	15	8	14	23	13
Z Persei	2 33.7	+41 46	9.4—12	3 01.4	4	19	23	3	11	12	23	17
TW Cassiop.	37.6	+65 19	8.2— 9.0	1 10.3	5	18	22	21	10	0	27	4
RY Persei	39.0	+47 43	8.0—10.3	6 20.7	3	23	17	17	8	7	22	0
RZ Cassiop.	39.9	+69 13	6.9— 8.1	1 04.7	8	16	23	0	7	9	21	17
TX Cassiop.	44.4	+62 22	9.4—10.1	2 22.2	4	16	22	5	9	19	27	8
ST Persei	53.7	+38 47	8.5—10.5	2 15.6	5	18	21	15	7	13	23	10
RX Cassiop.	2 58.8	+67 11	8.6— 9.1	32 07.6			23	13			25	21
Algol	3 01.7	+40 34	2.3— 3.5	2 20.8	8	22	26	3	4	17	21	22
RT Persei	16.7	+46 12	9.5—11.5	0 20.4	7	5	20	19	4	10	18	0
λ Tauri	55.1	+12 12	3.3— 4.2	3 22.9	5	14	21	9	7	5	23	0
RW Tauri	3 57.8	+27 51	7.1— [11	2 18.5	10	2	26	17	13	8	21	15
RV Persei	4 04.2	+33 59	9.5—11.0	1 23.4	4	16	20	11	14	3	29	22
RW Persei	13.3	+42 04	8.8—11.0	13 04.8	11	5	24	10	7	15	20	19
SZ Tauri	31.4	+18 20	7.2— 7.7	3 03.6	7	10	19	23	8	21	21	11
RS Cephei	4 48.6	+80 06	9.5—12.0	12 10.1	8	2	20	12	2	23	27	19
TT Aurigae	5 02.8	+39 27	7.8— 8.7	0 16.0	7	10	20	18	4	2	24	2
RY Aurigae	11.5	+38 13	10.7—11.7	2 17.5	4	23	21	8	7	17	24	1
RZ Aurigae	42.9	+31 40	10.6—13.3	3 00.3	10	13	22	14	10	16	22	17
SV Tauri	45.8	+28 05	9.4—11.0	2 04.0	9	11	26	19	5	12	22	20
Z Orionis	50.2	+13 40	9.7—10.7	5 04.9	5	9	26	4	6	14	27	9
SV Gemin.	54.6	+24 28	9.8— [11	4 00.2	9	4	25	5	3	5	19	5
RW Gemin.	5 55.4	+23 08	9.5—11.0	2 20.8	8	18	20	5	7	10	24	14
U Columbæ	6 11.2	—33 03	9.2—10.0	2 19.2	3	17	20	12	7	7	24	3
SX Gemin.	22.0	+20 37	10.8—11.5	1 08.8	2	22	19	7	5	17	22	3
RW Monoc.	29.3	+ 8 54	9.0—10.8	1 21.7	5	5	20	11	5	17	20	23
RX Gemin.	43.6	+33 21	8.8— 9.6	12 05.0	11	18	23	23	6	4	30	14
RU Monoc.	6 49.4	— 7 28	9.8—10.5	0 21.5	4	20	18	1	10	12	24	20
R Can. Maj.	7 14.9	—16 12	5.8— 6.4	1 03.3	9	18	23	10	7	1	20	16
RY Gemin.	21.7	+15 52	8.9— [10	9 07.2	8	23	27	14	6	22	25	12
Y Camelop.	27.6	+76 17	9.5—12	3 07.3	3	14	27	10	6	16	19	21
TX Gemin.	30.3	+17 08	10.0—11.9	2 19.2	4	1	20	20	7	15	24	11
RR Puppis	43.5	—41 08	9.4—10.7	6 10.3	4	14	23	21	6	17	19	14
V Puppis	7 55.4	—48 58	4.1— 4.8	1 10.9	7	17	22	6	6	19	21	8
X Carinæ	8 29.1	—58 53	7.9— 8.7	0 13.0	6	8	22	14	8	20	25	1
S Cancri	8 38.2	+19 24	8.2—10	9 11.6	10	12	29	11	8	23	27	22
RX Hydræ	9 00.8	— 7 52	9.1—10.5	2 06.8	10	0	23	17	7	9	21	2
S Velorum	29.4	—44 46	7.8— 9.3	5 22.4	5	14	17	11	5	6	23	1
Y Leonis	9 31.1	+26 41	9.3—11.2	1 16.5	6	14	20	2	10	8	23	19
RR Velorum	10 17.8	—41 36	10.0—10.9	1 20.5	5	2	19	22	12	4	27	0
SS Carinæ	10 54.2	—61 23	12.2—12.8	3 07.2	4	1	17	7	7	2	20	7
ST Urs. Maj.	11 22.4	+45 44	6.7— 7.2	8 19.2	8	22	26	12	5	7	22	22
RW Urs. Maj.	35.4	+52 34	10.3—11.4	7 07.9	11	1	25	16	10	8	25	0
Z Draconis	11 39.8	+72 49	9.9—13.6	1 08.6	10	0	23	14	7	4	20	17
RZ Centauri	12 55.6	—64 05	8.5— 8.9	1 21.0	5	3	20	4	5	4	20	4
RS Can. Ven.	13 06.3	+36 28	7.5—12.5	4 19.1	10	18	29	23	9	13	28	18
SS Centauri	07.2	—63 37	8.8—10.4	2 11.5	7	13	22	9	7	6	22	4
SX Hydræ	13 39.0	—26 23	8.6—12.7	2 21.5	3	1	22	9	9	18	21	8
δ Libræ	14 55.6	— 8 07	4.8— 6.2	2 07.9	6	22	20	21	4	20	18	19
U Coronæ	15 14.1	+32 01	7.6— 8.7	3 10.9	5	12	19	8	10	1	23	20

Minima of Variable Stars of Short Period—Continued.

Star	R.A. 1900		Decl. 1900		Magnitude	Approx. Period		Greenwich civil times of minima in 1926							
								Sept.				Oct.			
	h	m	°	′		d	h	d	h	d	h	d	h	d	h
TW Draconis	15	32.4	+64	14	7.3— 8.9	2	19.4	2	8	19	4	6	0	22	20
SS Libræ	15	43.4	—15	14	9.3—11.5	0	18.4	8	0	22	10	6	19	28	8
SW Ophiuchi	16	11.1	— 6	44	9.2—10.0	2	10.7	1	15	16	8	8	8	23	0
SX Ophiuchi		12.6	— 6	25	10.5—11.2	2	01.5	8	4	24	16	11	4	27	16
R Aræ		31.1	—56	48	6.8— 7.9	4	10.2	2	1	19	17	7	10	25	3
TT Herculis	16	49.9	+17	00	8.9— 9.3	20	18.1			15	12	6	6	27	0
TU Herculis	17	09.8	+30	50	9.5—12	2	06.4	8	7	21	21	5	12	19	2
U Ophiuchi		11.5	+ 1	19	6.0— 6.7	1	16.2	4	10	21	5	7	23	24	18
u Herculis		13.6	+33	12	4.6— 5.4	2	01.2	4	13	22	23	5	7	23	18
TX Herculis		15.4	+42	00	8.3— 9.0	2	01.4	9	6	21	15	10	4	21	12
RV Ophiuchi		29.8	+ 7	19	9. —12	3	16.5	5	20	20	14	5	7	20	1
SZ Herculis		36.0	+33	01	9.5—10.3	0	19.6	4	9	20	18	7	2	23	11
TX Scorpii		48.6	—34	13	7.5— 8.2	0	22 6	1	6	16	8	8	23	24	1
UX Herculis		49.7	+16	57	8.8—10.5	1	13.2	3	1	18	13	4	1	19	12
Z Herculis		53.6	+15	09	7.1— 7.9	3	23.8	6	18	22	17	8	17	24	16
WX Sagittarii		53.6	—17	24	9.2—10.8	2	03.1	9	5	26	6	4	19	21	19
WY Sagittarii	17	54.9	—23	01	9.5—10.6	4	16.0	10	6	24	6	8	7	22	7
SX Draconis	18	03.0	+58	23	9.3—10.5	5	04.1	9	4	24	16	10	5	25	17
RS Sagittarii		11.0	—34	08	5.9— 6.3	2	10.0	9	13	24	3	8	12	23	0
V Serpentis		11.1	—15	34	9.5—11.1	3	10.9	4	8	18	4	8	21	22	17
RZ Scuti		21.1	— 9	15	7.4— 8.3	15	03.2	10	15	25	18	10	22	26	1
RZ Draconis		21.8	+58	50	9.5—10.2	0	13.2	7	21	22	5	6	12	20	20
RX Herculis		26.0	+12	32	7.0— 7.6	0	21.3	8	3	22	9	6	14	20	20
SX Sagittarii		39.7	—30	36	8.7— 9.8	2	01.8	2	5	18	20	5	11	22	2
RR Draconis		40.8	+62	34	9.3—13	2	19.9	5	14	22	14	9	13	26	13
RS Scuti		43.7	—10	21	9.3—10.3	0	15.9	6	19	20	2	3	9	16	16
β Lyræ		46.4	+33	15	3.4— 4.1	12	21.8	9	13	22	11	5	9	18	6
U Scuti	18	48.9	—12	44	9.1— 9.6	0	22.9	1	17	16	23	9	21	25	4
RX Draconis	19	01.1	+58	35	9.3—10.2	1	21.4	2	8	17	12	10	5	25	9
RV Lyræ		12.5	+32	15	11. —12.8	3	14.4	5	7	19	16	4	2	18	12
RS Vulpec.		13.4	+22	16	6.9— 8.0	4	11.4	3	10	21	7	9	5	27	3
U Sagittæ		14.4	+19	26	6.5— 9.0	3	09.1	8	17	22	5	5	18	19	6
Z Vulpec.		17.5	+25	23	7.3— 8.5	2	10.9	12	16	20	1	12	3	26	21
TT Lyræ		24.3	+41	30	9.4—11.6	5	05.8	8	13	19	0	10	0	20	12
UZ Draconis		26.1	+68	44	9.0— 9.8	1	15.1	7	17	20	18	10	8	23	9
SY Cygni	19	42.7	+32	28	10. —12	6	00.2	5	13	17	13	5	13	17	14
WW Cygni	20	00.6	+41	18	9.3—13.4	3	07.6	9	11	22	18	6	0	19	7
SW Cygni		03.8	+46	01	9. —11.7	4	13.8	6	11	20	4	8	12	22	5
VW Cygni		11.4	+34	12	9.8—11.8	8	10.3	3	14	20	11	7	7	24	4
RW Capric.		12.2	—17	59	8.8—10.6	3	09.4	7	3	20	16	4	6	24	14
UW Cygni		19.6	+42	55	10.5—13	3	10.8	4	5	18	0	8	17	22	12
V Vulpec.		32.3	+26	15	8.2— 9.8	37	19.0	5	12			12	7		
W Delphini		33.1	+17	56	9.4—12.1	4	19.4	9	1	23	11	7	21	22	7
RR Delphini		38.9	+13	35	10.5—11.8	4	14.4	6	20	25	6	4	10	22	20
Y Cygni		48.1	+34	17	7.1— 7.9	2	23.9	3	3	21	2	9	2	27	1
WZ Cygni		49.3	+38	27	9.9—10.8	0	14.0	5	19	21	0	6	5	21	10
RR Vulpec.	20	50.5	+27	32	9.6—11.0	5	01.2	9	17	29	22	10	0	30	5
RY Aquarii	21	14.8	—11	14	8.8—10.4	1	23.2	1	23	17	17	3	10	19	4
UZ Cygni		55.2	+43	52	8.9—11.6	31	07.3	1	3			2	10		
RT Lacertæ	21	57.4	+43	24	9.1—10.5	5	01.7	7	10	22	15	7	20	23	2
RW Lacertæ	22	40.6	+49	08	10.2—11.2	5	04.4	6	17	22	6	7	19	23	8
VW Pegasi		51.7	+32	42	10.0—10.6	5	06.4	5	11	21	6	7	1	22	21
Y Piscium	23	29.3	+ 7	22	9.0—12.0	3	18.4	2	14	17	16	2	17	17	19
TW Androm.	23	58.2	+32	17	8.6—11.5	4	02.9	9	13	26	1	4	7	20	18

Monthly Report of the American Association of Variable Star Observers, May and June, 1926.

A double report of our activities is presented herewith, covering the observations received during the months of May and June, 1926. It stands as a splendid record of what may be accomplished by well directed and concerted efforts. This same *esprit de corps* was again indicated by the keen interest manifested at the recent meeting of the Association held at Smith College, Northampton, Mass., on May 28 and 29. Professor Harriet Bigelow and her able staff of aids certainly did all possible to make the meeting a memorable occasion, and it will go down in the records as "the best yet." Dr. Green of Amherst, gave us of his time and knowledge, and Miss Young, of Mt. Holyoke College, also added to the pleasure of the occasion with her usual charm and cordiality. It is with pleasure that we note the election of two new Patrons by the Council, both most deserving. Mrs. Clara M. Olcott, wife of our Secretary who has shared with him so generously with the contributions to the Pickering Memorial, and Mr. J. H. Skaggs, the originator and principal mainstay of Variable Comments, were the members so honored. Mr. R. S. Chisolm has prepared for a forthcoming number of Variable Comments a detailed account of the meeting. It was voted to hold the Annual Fall Meeting at Harvard Observatory, Cambridge, on October 23, at which time it is hoped to have several members of the Neighborhood Club as guests, as well as Dr. Hertzsprung, of Leiden, Holland.

Miss Alderton, who has been observing the past few months at Vassar under the guidance of Miss Hawes, has joined the Association, and with a newly acquired 3-inch glass expects to continue the work. Mr. Petrie, of Vancouver, B. C., must give up active observing for the present, since he goes to the Astrophysical Observatory of that place for a summer of research and study. The Pickering reflector will be turned over to Mr. Christie again. Mr. G. E. Ensore, of Pretoria, So. Africa, has become an active contributor to our columns, with credit to himself and to us. It is a pleasure to welcome back to the ranks of active observing our former ace contributor, Mr. Bancroft. Mr. Elmer is "doing" the west coast and incidently, the great observatories.

It is with a deep sense of regret that we note the retirement from active duty, especially as far as our reports are concerned, of Professor H. C. Wilson. To him, as much as to any other, is the Association indebted for its success, for it was he who first threw out the suggestion that an organization such as ours should be formed in this country. His continued interest and encouragement has done much to further our progress. Without the columns of POPULAR ASTRONOMY to display our results so promptly, our work would have been doubtless slow and well nigh impossible. To Professor Wilson the Association extends its best wishes for a long period of the pleasures which come with the retirement from an active life. To Professors Fath and Gingrich we look for further guidance and help, and trust that our efforts may well warrant the time and energy which they must of necessity put into our work.

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926.

Apr. 0 = J. D. 2424606; May 0 = J. D. 2424636; June 0 = J. D. 2424667.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
000339 V SCULPTORIS—						
	4581.9	[13.3	Bl	4622.3	11.2	Bl
001032 S SCULPTORIS—						
	4575.9	10.5	Bl	4622.3	11.9	Bl
001046 X ANDROMEDAE—						
	4650.8	14.4	Wf	4674.8	13.0	Wf
	4666.8	13.7	Wf			
001726 T ANDROMEDAE—						
	4642.4	9.8	Ch	4674.8	8.2	Pt
	4647.8	9.6	Pt			
001755 T CASSIOPEIAE—						
	4610.3	7.6	L	4666.5	9.2	L
	4627.4	8.6	Ch	4670.8	9.8	Jo
	4634 6	8.2	L	4674.8	10.7	Pt
	4640.8	9.5	Jo	4676.7	10.5	Jo
	4647.8	8.2	Pt	4683.8	10.8	Jo
	4648.8	9.0	Jo	4686.7	10.9	Jo
001838 R ANDROMEDAE—						
	4642.4	9.5	Ch	4674.8	7.9	Wf
	4647.8	9.0	Pt	4674.8	7.0	Pt
	4650 8	9.0	Wf	4683.8	7.2	Jo
	4663.8	8.6	Wf	4686.8	7.1	Jo
	4670.8	8.1	Wf			
001862 S TUCANAE—						
	4575.9	8.7	Bl	4600.9	9.5	Bl
	4585.3	8.8	Sm	4611.9	9.8	Bl
	4589.0	8.6	Bl	4621.9	10.6	Bl
002546 T PHOENICIS—						
	4581.9	[13.0	Bl	4621.9	[12.2	Bl
002833 W SCULPTORIS—						
	4581.9	[12.8	Bl			
004047 U CASSIOPEIAE—						
	4620.6	11.7	Wf	4666.8	9.4	Wf
	4647.8	10.5	Pt	4674.8	8.8	Wf
	4648.8	10.8	Wf	4674.8	8.4	Pt
004132 RW ANDROMEDAE—						
	4647.8	11.5	Pt			
004435 X SCULPTORIS—						
	4581.9	[13.2	Bl	4622.3	[12.3	Bl
004533 RR ANDROMEDAE—						
	4650.8	11.7	Wf	4674.8	10.6	Wf
	4666.8	11.2	Wf			
004746a RV CASSIOPEIAE—						
	4648.8	[14.0	Wf	4672.8	14.8	Wf
	4650.8	[14.7	Wf	4674.8	14.3	Wf
004746b — CASSIOPEIAE—						
	4648.8	10.7	Wf	4674.8	10.5	Pt
	4672 8	10.5	Wf			
004958 W CASSIOPEIAE—						
	4647.8	8.8	Pt	4674.8	8.6	Pt
005475 U TUCANAE—						
	4575.9	8.5	Bl	4595.2	8.3	En
	4576.3	8.9	En	4600.9	8.0	Bl
	4578.2	8.6	En	4611.2	8.4	En
	4583.2	8.4	En	4611.9	8.6	Bl
	4585.3	8.5	Sm	4621.9	9.0	Bl
	4589.2	8.3	En	4625.3	9.2	Sm
	4589.9	7.9	Bl	4632.9	9.3	Bl
	4592.3	8.5	Sm			
005840 RX ANDROMEDAE—						
	4674.8	[11.7	Pt	4687.7	10.6	Cu
	4676.8	[13.0	Cu			
010630 U SCULPTORIS—						
	4581.9	[13.2	Bl			
010884 RU CEPHEI—						
	4670.7	9.5	Cu	4687.7	9.1	Cu
	4676.7	9.6	Cu	4688.6	8.9	Cu
	4685.6	9.3	Cu	4691.7	8.6	Cu
	4686.6	9.3	Cu			
010940 U ANDROMEDAE—						
	4650.9	11.3	Wf	4674.8	12.3	Wf
	4670.8	12.0	Wf			
011041 UZ ANDROMEDAE—						
	4650.9	[14.2	Wf	4670.8	14.0	Wf
011272 S CASSIOPEIAE—						
	4622.8	15.0	Wf	4670.8	14.1	Wf
	4648.8	14.6	Wf	4674.8	14.1	Wf
	4650.9	14.8	Wf			
013238 RU ANDROMEDAE—						
	4670.8	13.4	Wf			
014958 X CASSIOPEIAE—						
	4647.8	13.2	Pt	4674.8	13.2	Pt
015254 U PERSEI—						
	4641.6	9.4	Pt	4674.8	8.4	Pt
021143a W ANDROMEDAE—						
	4620.7	10.0	Wf	4674.8	12.4	Wf
	4670.8	12.4	Wf	4674.8	11.9	Pt
021258 T PERSEI—						
	4616.1	8.7	Ch	4674.8	8.7	Pt
	4641.6	8.6	Pt			
021281 Z CEPHEI—						
	4622.7	12.6	Wf	4648.8	14.1	Wf
	4637.7	13.7	Wf	4670.8	15.0	Wf
	4641.6	13.6	Pt			
021403 o CETI—						
	4521.6	3.8	Pj	4542.6	4.5	Pj
	4523.8	4.1	Pj	4585.9	6.8	Kd
	4527.6	4.2	Pj	4586.9	6.6	Kd
	4541.6	4.5	Pj	4590.9	6.9	Kd
021558 S PERSEI—						
	4616.1	9.4	Ch	4643.4	9.5	Kl
	4622.4	10.2	Kl	4674.8	8.8	Pt
	4641.6	9.1	Pt			
022150 RR PERSEI—						
	4648.8	10.0	Wf	4670.8	9.6	Wf
022426 R FORNACIS—						
	4575.9	10.6	Bl	4600.9	11.2	Bl
	4589.9	11.2	Bl	4621.9	[11.9	Bl
022980 RR CEPHEI—						
	4622.8	14.9	Wf	4670.8	14.2	Wf
	4648.8	14.8	Wf			
023133 R TRIANGULI—						
	4616.1	8.4	Ch	4674.8	6.3	Pt
024356 W PERSEI—						
	4621.6	9.3	Cy	4641.6	9.4	Pt
	4626.8	9.2	Cy	4674.8	9.6	Pt
	4640.6	9.3	Cy			

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
025050 R HOROLOGII—						
	4575.9	8.8	Bl	4595.3	10.2	En
	4578.3	9.6	En	4600.9	10.0	Bl
	4583.2	9.9	En	4607.3	10.2	En
	4585.3	9.8	Sm	4611.9	10.9	Bl
	4589.0	9.5	Bl	4619.3	10.9	En
	4589.2	10.0	En	4621.9	11.3	Bl
	4592.3	10.0	Sm	4632.9	11.3	Bl
025751 T HOROLOGII—						
	4575.9	7.3	Bl	4600.9	8.5	Bl
	4585.3	8.3	Sm	4611.9	9.4	Bl
	4589.0	7.5	Bl	4621.9	9.6	Bl
	4592.3	8.3	Sm	4632.9	10.0	Bl
032043 Y PERSEI—						
	4641.6	10.1	Pt	4674.8	9.2	Pt
032335 R PERSEI—						
	4622.6	12.0	Wf			
042209 R TAURI—						
	4616.1	9.8	Ch			
042215 W TAURI—						
	4621.6	9.7	Cy			
042309 S TAURI—						
	4616.1	[10.6	Ch			
043065 T CAMELOPARDALIS—						
	4610.4	11.7	L	4641.6	9.7	Pt
	4620.6	10.6	L	4658.5	9.0	L
	4626.5	9.9	Cl	4669.6	8.9	Pt
043263 R RETICULI—						
	4581.9	[12.5	Bl	4618.2	[12.2	Ht
	4584.3	[12.2	En	4621.9	12.4	Bl
	4591.3	[12.2	Sm	4623.2	12.4	Ht
	4601.3	[12.2	En			
043274 X CAMELOPARDALIS—						
	4620.1	[11.7	Ch	4669.6	7.7	Pt
	4641.6	10.0	Pt			
043562 R DORADUS—						
	4575.9	5.5	Bl	4611.9	5.5	Bl
	4584.3	5.8	En	4617.3	5.4	En
	4589.0	5.6	Bl	4621.9	5.5	Bl
	4589.2	5.7	En	4618.2	5.5	Ht
	4591.3	5.3	Sm	4622.3	5.3	En
	4595.3	5.6	En	4623.2	5.5	Ht
	4600.9	5.5	Bl	4625.2	5.3	Sm
	4601.3	5.6	En	4629.2	5.5	Ht
	4609.3	5.4	En	4632.9	5.5	Bl
043738 R CAELI—						
	4581.9	12.4	Bl	4621.9	10.1	Bl
	4589.0	11.9	Bl	4623.2	10.2	Ht
	4591.3	12.0	Sm	4625.3	9.7	Sm
	4600.9	11.5	Bl	4629.2	9.8	Ht
	4611.9	10.8	Bl	4632.9	9.0	Bl
	4618.2	10.4	Ht			
044349 R PICTORIS—						
	4575.9	6.5	Bl	4611.9	7.0	Bl
	4581.9	6.5	Bl	4621.9	7.6	Bl
	4589.0	6.5	Bl	4632.9	7.8	Bl
	4600.9	7.1	Bl			
044617 V TAURI—						
	4615.1	10.6	Ch	4620.6	10.1	Wf
045514 R LEPORIS—						
	4598.1	8.6	Ch	4615.1	8.3	Ch
	4610.3	7.2	L	4623.1	8.6	Ch
050022 T LEPORIS—						
	4575.9	8.9	Bl	4611.9	10.2	Bl
	4589.0	9.3	Bl	4621.9	10.5	Bl
	4600.9	9.4	Bl	4632.9	10.6	Bl
050848 S PICTORIS—						
	4576.0	11.7	Bl	4607.3	8.7	En
	4578.3	11.2	En	4611.9	8.7	Bl
	4584.4	10.6	En	4619.3	8.8	En
	4589.0	9.3	Bl	4621.9	8.7	Bl
	4589.3	10.0	En	4623.3	7.8	Sm
	4591.3	9.3	Sm	4626.2	8.8	En
	4595.3	9.6	En	4632.9	8.5	Bl
	4601.0	8.6	Bl			
050953 R AURIGAE—						
	4620.6	13.3	Wf	4641.6	12.0	At
	4628.7	12.9	Wf	4663.7	10.5	Wf
	4638.6	12.2	Lv	4669.6	11.3	Pt
	4639.6	12.7	Pt	4670.7	10.6	Wf
	4641.6	12.0	Hs	4675.8	10.6	Wf
	4648.7	11.7	Wf			
051247 T PICTORIS—						
	4578.3	12.5	En	4611.9	9.7	Bl
	4581.9	12.0	Bl	4618.2	9.2	Ht
	4585.3	12.0	En	4619.3	9.2	En
	4589.0	11.4	Bl	4621.9	9.5	Bl
	4589.3	11.8	En	4623.2	9.2	Ht
	4592.3	11.8	Sm	4623.3	9.3	Sm
	4595.3	11.2	En	4626.2	9.0	En
	4601.0	11.0	Bl	4629.2	9.0	Ht
	4607.3	9.4	En	4632.9	9.2	Bl
051533 T COLUMBAE—						
	4576.0	7.7	Bl	4618.3	9.4	Ht
	4578.3	7.6	En	4619.2	9.9	En
	4583.3	7.7	En	4621.9	9.5	Bl
	4589.0	7.8	Bl	4623.2	9.7	Ht
	4589.4	8.0	En	4623.3	10.1	Sm
	4591.3	8.3	Sm	4626.2	10.0	En
	4595.3	8.4	En	4629.2	10.1	Ht
	4601.0	8.3	Bl	4632.9	9.6	Bl
	4609.3	9.0	En	4635.2	10.2	En
	4611.9	8.9	Bl			
052034 S AURIGAE—						
	4617.1	9.1	Ch	4641.6	9.3	At
	4628.6	9.0	B	4641.6	8.2	Pt
	4632.6	9.2	Pw	4642.6	9.1	Hs
	4635.6	9.1	Pw	4642.6	9.1	Ci
	4641.6	9.2	Hs	4642.6	9.2	At
052036 W AURIGAE—						
	4623.6	[11.5	B	4639.6	[12.5	B
052404 S ORIONIS—						
	4628.5	9.8	B	4636.5	10.1	B
053005a T ORIONIS—						
	4610.3	9.8	L	4628.5	10.2	B
	4625.6	10.0	Pt	4636.5	10.2	B
053068 S CAMELOPARDALIS—						
	4626.5	8.6	Cl	4669.6	8.4	Pt
	4641.6	8.4	Pt	4686.8	8.5	Jo
053531 U AURIGAE—						
	4617.1	[11.2	Ch	4639.6	[12.7	B
054319 SU TAURI—						
	4610.3	[14.0	L	4627.6	[12.4	B
	4622.6	[13.2	Wf	4642.6	[12.6	Wf

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
054331 S COLUMBAE—						
	4576.0	9.2	Bl	4617.3	10.0	En
	4583.3	9.2	En	4618.3	10.2	Ht
	4589.0	9.1	Bl	4621.9	9.8	Bl
	4589.3	8.9	En	4623.2	10.0	Ht
	4591.3	9.2	Sm	4623.3	10.0	Sm
	4595.3	8.9	En	4626.2	10.1	En
	4601.0	9.2	Bl	4629.2	9.9	Ht
	4601.3	9.2	En	4632.9	10.0	Bl
	4609.3	9.8	En	4635.2	10.3	En
	4611.9	9.5	Bl			
054629 R COLUMBAE—						
	4576.6	11.7	Bl	4611.9	8.5	Bl
	4578.3	11.8	En	4619.2	9.0	En
	4583.3	11.0	En	4621.9	8.7	Bl
	4589.3	10.3	En	4623.3	9.3	Ht
	4589.6	10.0	Bl	4623.3	8.9	Sm
	4591.3	9.3	Sm	4626.2	9.3	En
	4595.3	9.6	En	4629.2	9.0	Ht
	4601.0	9.0	Bl	4632.9	8.9	Bl
	4609.3	8.4	En			
054920b VW ORIONIS—						
	4621.6	10.3	Cy	4640.6	10.2	Cy
	4626.6	10.5	Cy	4644.6	10.2	Cy
054974 V CAMELOPARDALIS—						
	4620.6	12.2	Wf	4663.7	12.7	Wf
	4628.7	12.3	Wf	4670.7	13.2	Wf
	4633.6	12.4	B	4672.7	13.1	Wf
	4637.6	13.0	Ie	4674.7	13.1	Wf
	4648.7	12.6	Wf			
055353 Z AURIGAE—						
	4608.2	10.0	Ch	4641.6	10.3	At
	4611.1	10.0	Ch	4641.6	10.4	Pt
	4616.1	10.4	Ch	4642.6	10.4	Pt
	4620.7	10.1	Wf	4646.6	10.0	Pt
	4622.1	10.4	Ch	4648.6	10.5	Pt
	4625.6	10.0	Pt	4648.7	10.3	Wf
	4626.6	10.0	Pt	4651.1	10.7	Ch
	4631.7	10.2	Pt	4652.7	10.6	Pt
	4632.6	10.3	Pt	4656.6	10.6	Pt
	4633.6	10.3	Hs	4659.6	10.6	Pt
	4633.7	10.2	Wf	4660.6	10.6	Pt
	4634.6	10.4	Pt	4663.6	10.7	Pt
	4635.6	10.5	Pt	4664.6	10.5	Pt
	4636.1	10.6	Ch	4666.7	10.5	Pt
	4636.7	10.5	Pt	4666.7	10.3	Wf
	4637.6	10.3	Hs	4669.6	10.6	Pt
	4637.6	10.4	Ci	4672.7	10.2	Wf
	4639.7	10.4	Pt	4676.7	10.0	Pt
	4641.6	10.4	Hs	4677.6	10.0	Pt
	4641.6	10.3	Ci			
055686 R OCTANTIS—						
	4576.0	8.2	Bl	4611.9	9.8	Bl
	4589.0	8.4	Bl	4621.9	10.0	Bl
	4592.3	8.7	Sm	4625.3	9.8	Sm
	4601.6	9.2	Bl	4632.9	10.1	Bl
060450 X AURIGAE—						
	4592.2	8.9	Ch	4626.1	10.0	Ch
	4599.2	8.8	Ch	4627.6	10.1	B
	4601.2	8.9	Ch	4635.6	10.8	B
	4611.1	9.1	Ch	4636.1	10.6	Ch
	4615.2	9.2	Ch	4641.6	10.8	Pt
060450 X AURIGAE—Continued.						
	4616.2	9.3	Ch	4642.6	10.3	Pc
	4620.1	9.7	Ch	4642.6	11.0	Hs
	4621.5	10.0	Pw	4642.6	10.9	Ci
	4623.1	9.8	Ch	4669.6	11.2	Pt
060547 SS AURIGAE—						
	4610.3	15.0	L	4641.6	[12.6	Pt
	4611.4	[14.0	L	4642.6	[12.6	Pt
	4612.1	[11.6	Ch	4643.7	[12.4	Pt
	4615.2	[11.6	Ch	4645.4	15.0	L
	4616.1	[11.6	Ch	4646.6	[13.7	Lv
	4617.1	[11.6	Ch	4647.6	[12.4	Pt
	4618.7	15.1	Wf	4648.7	[13.0	Wf
	4619.1	[11.6	Ch	4649.7	[12.4	Bh
	4620.5	[12.4	L	4650.7	[13.9	Wf
	4621.6	[13.0	Cy	4651.6	[13.3	Lv
	4622.7	[14.5	Wf	4652.7	[12.6	Pt
	4623.7	[11.6	Bh	4653.6	[12.4	Cl
	4625.6	[12.4	Pt	4656.4	[12.4	L
	4626.6	[12.4	Cl	4660.6	10.8	Lv
	4627.6	[13.2	B	4663.7	11.2	Wf
	4628.7	[13.9	Wf	4664.6	11.3	Pt
	4631.7	[12.6	Pt	4666.7	12.0	Wf
	4633.7	[13.0	Wf	4666.7	12.2	Pt
	4634.6	[12.4	Pt	4669.6	[12.4	Pt
	4635.6	[13.7	B	4670.6	[12.6	Pt
	4636.6	[13.4	B	4672.7	[13.5	Wf
	4637.7	[13.9	Wf	4675.7	[13.5	Wf
	4638.6	[13.7	Lv	4676.7	[12.4	Pt
	4639.6	[13.5	B	4677.6	[12.4	Pt
	4640.6	[13.0	Cy	4687.6	[11.4	Cu
061647 V AURIGAE—						
	4627.6	10.0	B	4642.6	10.7	Ci
	4642.6	10.8	Hs			
061702 V MONOCEROTIS—						
	4612.1	9.8	Ch			
063159 U LYNCIS—						
	4627.6	9.7	B			
063308 R MONOCEROTIS—						
	4627.6	11.6	B	4641.6	10.7	Pt
	4635.6	11.7	B			
063462 NOVA PICTORIS, 1925—						
	4576.0	5.3	Bl	4601.0	5.6	Bl
	4582.0	5.4	Bl	4622.1	5.5	Bl
	4589.1	5.5	Bl	4632.9	5.6	Bl
063558 S LYNCIS—						
	4641.6	14.3	Pt	4669.6	14.0	Pt
064030 X GEMINORUM—						
	4648.5	[12.5	O			
064707 W MONOCEROTIS—						
	4628.6	9.3	B			
065111 Y MONOCEROTIS—						
	4638.6	13.1	Lv	4639.6	12.8	B
065208 X MONOCEROTIS—						
	4610.3	9.1	L	4645.3	8.7	L
	4617.1	9.5	Ch			
065355 R LYNCIS—						
	4620.6	11.7	Wf	4663.7	10.0	Wf
	4628.7	11.4	Wf	4669.6	9.7	Pt
	4648.7	10.6	Wf	4670.7	9.7	Wf

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
070122a R GEMINORUM—						
	4608.1	10.5	Ch	4635.6	11.5	Lv
	4611.5	10.0	Ls	4635.6	11.3	B
	4620.6	10.7	Wf	4640.7	12.1	Pt
	4622.1	10.9	Ch	4644.6	12.0	B
	4628.6	10.6	B	4648.7	11.7	Wf
	4628.7	11.0	Wf			
070122b Z GEMINORUM—						
	4635.6	12.4	B	4644.6	12.4	B
	4640.7	12.3	Pt			
070122c TW GEMINORUM—						
	4611.5	8.6	Ls	4635.6	8.2	B
	4628.6	8.3	B	4640.7	7.9	Pt
	4635.6	8.3	Lv	4644.6	8.3	B
070310 R CANIS MINORIS—						
	4610.3	10.5	L	4645.3	11.3	L
	4617.1	10.5	Ch	4650.6	10.7	B
	4628.6	11.2	B			
070772 R VOLANTIS—						
	4585.3	10.4	Sm	4623.3	10.4	Ht
	4592.3	10.4	Sm	4625.3	9.9	Sm
	4618.3	10.4	Ht	4629.3	10.2	Ht
071713 V GEMINORUM—						
	4627.6	10.7	B	4640.7	11.5	Pt
	4635.6	11.4	B	4644.6	11.6	B
072708 S CANIS MINORIS—						
	4592.2	7.8	Ch	4635.6	9.2	B
	4608.1	8.3	Ch	4640.6	9.6	Cy
	4610.3	8.1	L	4640.7	9.7	Pt
	4611.5	8.5	Ls	4642.1	9 9	Ch
	4613.5	8.6	Ls	4645.3	9.5	L
	4616.2	8.6	Ch	4646.6	9.5	B
	4626.1	9.1	Ch	4648.5	9.9	O
	4628.6	8.9	B			
072811 T CANIS MINORIS—						
	4640.7	11.1	Pt			
073173 S VOLANTIS—						
	4576 0	9.3	Bl	4611.9	10.5	Bl
	4589.0	9.6	Bl	4621.9	10.9	Bl
	4601.0	9.4	Bl	4632.9	10.9	Bl
073508 U CANIS MINORIS—						
	4610.3	9.2	L	4645.3	8.9	L
	4628.6	9.3	B	4646.6	8.8	B
	4635.6	9.1	B	4648.5	8 8	O
	4640.7	8.9	Pt			
073723 S GEMINCRUM—						
	4592.2	12.2	Ch	4639.6	13.7	B
	4610.2	12.6	Ch			
074241 W PUPPIS—						
	4576.0	9.8	Bl	4621.9	8.9	Bl
	4589.0	9.0	Bl	4623.3	8 9	Ht
	4601.0	8.2	Bl	4623.3	8.9	Sm
	4612.1	8.7	Bl	4629.2	9 0	Ht
	4618.3	8.9	Ht	4632.9	9.1	Bl
074323 T GEMINCRUM—						
	4592.2	9.1	Ch	4619.2	10.7	Ch
	4596.2	9.2	Ch	4622.2	10.8	Ch
	4600.2	9.3	Ch	4627.6	10 9	B
	4610.2	9.5	Ch	4635.6	11.3	B
	4612.1	10.0	Ch	4642.1	11.4	Ch
	4616.1	10.3	Ch	4650.6	12.3	B
074922 U GEMINORUM—						
	4601.2	9.6	Ch	4638.6	[13.8	Lv
	4602.2	9.6	Ch	4639.6	14.0	B
	4608.1	9.4	Ch	4640.6	[13.3	Cy
	4610.2	9.8	Ch	4641.6	[12.4	Cy
	4610.3	11.0	L	4642.6	[13.3	Pt
	4611.1	10.0	Ch	4643.6	[12.4	Cy
	4611.4	10.6	L	4644.6	[13.8	B
	4615.2	[12.4	Ch	4645.4	13.9	L
	4617.1	[12.4	Ch	4646.6	[13.7	Lv
	4618.7	14.3	Wf	4647.6	[12.4	Pt
	4619.2	[12.3	Ch	4648.5	[12.4	O
	4621.6	[13.3	Cy	4648.7	14.1	Wf
	4622.7	14.2	Wf	4649.6	13.9	Lv
	4626.6	[12.4	Cy	4650.7	14.1	Wf
	4627.6	[12.7	B	4651.1	[11.4	Ch
	4628.7	[13.3	Wf	4663.7	[12.4	Wf
	4633.7	[13.3	Wf	4665.6	[13 3	B
	4634.6	[12.4	Pt	4666.7	[12.4	Wf
	4635.5	[13.7	B	4668.7	[12.4	Wf
	4636.6	[13.8	B	4669.6	[11.7	Pt
	4637.6	[13.3	Ie	4670.6	[11.3	Pt
081112 R CANCRI—						
	4592 2	6.6	Ch	4638.5	7.6	Kb
	4608.3	6.5	Ch	4639.7	7.1	Pt
	4610.3	6.9	L	4640.6	7.4	Cy
	4617.1	6.8	Ch	4645.3	7.2	L
	4621.6	7.5	Cy	4649.1	7.3	Ch
	4623.6	6.8	Kb	4649.5	7.6	Kb
	4631.1	7.1	Ch	4654.6	7.0	B
	4633.6	6.6	B	4669.6	8.1	Pt
081617 V CANCRI—						
	4621.6	12.0	Cy	4644.6	9.9	B
	4639.7	11.0	Pt	4669.6	8.9	Pt
	4640 6	10.4	Cy			
082405 RT HYDRAE—						
	4640.6	8.2	Pt	4646.6	8.2	B
082476 R CHAMAELEONTIS—						
	4581.9	12.6	Bl	4611.9	11.1	Bl
	4585.3	12.8	Sm	4617.3	9.7	En
	4589.9	12.5	Bl	4621.9	9.9	Bl
	4592.3	12.4	Sm	4622.3	10 3	En
	4595.3	12.0	En	4623.3	9.9	Sm
	4601.0	12.2	Bl	4632.9	8.8	Bl
	4609.3	11.7	En			
083019 U CANCRI—						
	4621.6	[13.3	Cy	4648.7	14.3	Wf
	4639.6	[13.7	Lv	4666 9	[12.4	Wf
	4646.6	[13.6	Lv	4672.7	12.4	Wf
083350 X URSAE MAJORIS—						
	4639.6	[13.7	Lv	4644.6	[13.8	B
	4640.5	[10.4	Cg	4670.6	[13.5	B
084803 S HYDRAE—						
	4621.6	12.3	Cy	4644.6	11.1	B
	4640.7	11.1	Pt	4669.6	9.9	Pt
085008 T HYDRAE—						
	4592.2	9.4	Ch	4633.6	7.8	B
	4610.3	8.8	L	4636.1	7.4	Ch
	4611.1	8.5	Ch	4640.7	7.4	Pt
	4619.2	8 3	Ch	4645.3	7.3	L
	4626.5	7.8	Ie	4649.1	7.5	Ch

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
085120 T CANCRI—						
	4612.2	9.5	Ch	4640.7	8.4	Cy
	4621.6	8.8	Cy	4640.7	8.0	Pt
	4622.2	9.1	Ch	4646.6	9.9	B
	4638.2	9.2	Ch	4669.6	8.0	Pt
090024 S PYXIDIS—						
	4641.6	11.1	Pt			
090151 V URSAE MAJORIS—						
	4633.6	10.2	B	4686.6	10.5	Cu
	4639.6	10.2	B	4687.7	10.5	Cu
	4653.6	10.3	B	4688.6	10.5	Cu
	4676.7	10.6	Cu	4691.6	10.5	Cu
	4685.6	10.5	Cu			
090425 W CANCRI—						
	4618.7	8.0	Wf	4648.7	9.0	Wf
	4621.7	8.0	Cy	4651.6	9.4	B
	4632.6	8.2	Pw	4666.7	10.0	Wf
	4633.6	8.4	B	4672.7	10.1	Wf
	4633.7	8.4	Wf	4674.6	10.0	B
	4640.7	8.7	Cy			
091868 RW CARINAE—						
	4576.0	8.6	Bl	4611.9	9.8	Bl
	4589.0	9.4	Bl	4621.9	10.4	Bl
	4601.0	9.6	Bl	4633.0	11.0	Bl
092551 Y VELORUM—						
	4582.0	13.3	Bl	4621.9	[12.9	Bl
092962 R CARINAE—						
	4576.0	9.7	Bl	4611.9	9.7	Bl
	4584.3	10.0	En	4618.3	9.7	Ht
	4585.3	9.6	Sm	4619.3	9.8	En
	4589.0	9.9	Bl	4621.9	9.6	Bl
	4589.3	10.0	En	4623.3	9.7	Ht
	4591.3	9.7	Sm	4626.2	9.7	En
	4595.3	10.0	En	4629.3	9.7	Ht
	4601.0	9.8	Bl	4633.0	9.4	Bl
	4609.3	9.8	En	4635.3	9.4	En
093014 X HYDRAE—						
	4611.1	10.9	Ch	4640.7	11.5	Pt
	4633.6	11.5	B	4644.6	11.8	B
093178 Y DRACONIS—						
	4620.2	9.4	Ch	4640.6	10.1	Jo
	4626.6	9.7	Ie	4640.7	10.0	Cy
	4626.6	9.8	Cy	4648.7	10.5	Jo
093934 R LEONIS MINORIS—						
	4595.0	7.1	Ch	4641.6	7.0	Hs
	4612.2	6.4	Ch	4641.6	7.0	Ci
	4625.2	6.0	Ch	4641.6	7.0	At
	4632.2	6.6	Ch	4642.6	7.4	Hs
	4633.6	6.5	B	4642.6	7.4	Ci
	4637.6	7.0	Hs	4643.6	7.2	Jo
	4637.6	7.2	Ci	4647.2	7.1	Ch
	4637.3	6.8	Ro	4651.6	7.3	B
	4638.2	7.0	Ch	4669.6	7.7	Pt
	4640.7	6.8	Pt	4674.6	7.8	B
094211 R LEONIS—						
	4595.0	5.8	Ch	4640.7	6.6	Cy
	4612.2	6.5	Ch	4642.6	7.4	Hs
	4617.3	6.4	Ro	4642.6	7.4	Ci
	4621.6	6.1	Pw	4643.6	6.5	Jo
	4625.2	6.6	Ch	4647.2	7.4	Ch
	4631.1	7.2	Ch	4647.6	6.6	Pw
	4632.6	6.5	Pw	4648.6	7.4	Hs
094211 R LEONIS—Continued.						
	4633.6	7.0	Hs	4648.6	7.5	At
	4633.6	7.0	Ci	4648.6	7.5	Ci
	4633.6	7.2	Gr	4648.1	6.9	Jn
	4633.6	6.6	B	4648.3	6.9	Ro
	4635.5	6.5	Pw	4648.6	6.7	Jo
	4636.3	6.7	Ro	4653.6	6.6	Cl
	4637.6	7.3	Hs	4656.6	6.8	Pw
	4637.6	7.3	Ci	4668.7	7.0	Pw
	4637.6	6.5	Pw	4669.6	7.4	Pt
	4637.6	6.5	Jo	4670.6	7.7	Jo
	4639.7	6.4	Pt	4674.6	7.8	B
	4640.6	6.6	Pw	4675.7	7.2	Pw
094512 X LEONIS—						
	4612.5	[14.0	L	4677.6	13.3	Cu
	4676.6	13.1	Cu	4687.6	[12.3	Cu
094622 Y HYDRAE—						
	4641.6	6.3	Pt			
094953 Z VELORUM—						
	4576.0	9.8	Bl	4611.9	10.2	Bl
	4576.3	10.3	En	4618.3	10.7	Ht
	4585.3	10.0	En	4619.3	10.5	En
	4585.3	9.4	Sm	4621.9	10.4	Bl
	4589.0	9.6	Bl	4623.3	10.1	Ht
	4589.3	9.9	En	4624.3	10.7	En
	4592.3	9.4	Sm	4625.2	10.4	Sm
	4596.3	9.9	En	4629.3	10.9	Ht
	4601.0	9.9	Bl	4633.0	10.7	Bl
	4609.3	10.1	En			
095421 V LEONIS—						
	4618.7	12.2	Wf	4647.2	9.5	Ch
	4620.1	11.9	Ch	4648.7	9.3	Wf
	4621.7	11.8	Cy	4649.7	9.4	Lv
	4630.7	10.9	Lv	4653.6	9.1	Cl
	4633.7	10.6	Wf	4653.6	9.3	B
	4636.6	10.4	Lv	4660.7	9.0	Lv
	4638.7	10.3	Lv	4666.7	8.9	Wf
	4639.7	10.1	B	4669.6	9.0	Pt
	4639.7	10.3	Pt	4669.6	9.2	B
	4640.7	9.8	Cy	4672.7	9.2	Wf
	4646.6	9.5	Lv	4674.7	9.3	Lv
095563 RV CARINAE—						
	4582.0	12.7	Bl	4612.0	10.9	Bl
	4589.0	11.5	Bl	4621.9	10.9	Bl
	4601.0	11.1	Bl	4633.0	11.4	Bl
095814 RY LEONIS—						
	4616.4	9.2	Kl	4622.4	9.4	Kl
	4618.3	9.3	Kl	4643.4	10.0	Kl
	4619.4	9.3	Kl			
100661 S CARINAE—						
	4576.0	6.6	Bl	4612.0	5.3	Bl
	4582.3	6.1	Sm	4618.3	5.5	Ht
	4583.3	6.2	En	4619.3	5.5	En
	4589.0	6.3	Bl	4621.9	5.3	Bl
	4589.3	6.5	En	4623.3	5.5	Ht
	4591.3	6.0	Sm	4625.2	6.0	Sm
	4595.4	6.0	En	4626.3	5.5	En
	4599.3	5.8	En	4629.3	5.8	Ht
	4601.0	5.0	Bl	4633.0	5.5	Bl
	4609.3	5.5	En	4635.3	5.5	En

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
101058 Z CARINAE—						
	4582.0	[12.6	Bl	4622.0	[12.6	Bl
	4596.3	[12.3	En			
101153 W VELORUM—						
	4576.0	11.1	Bl	4601.0	11.4	Bl
	4585.3	11.6	Sm	4612.0	11.9	Bl
	4589.0	11.4	Bl	4622.0	12.2	Bl
	4592.3	11.3	Sm			
103212 U HYDRAE—						
	4586.1	5.7	Kd	4612.9	6.0	Kd
	4592.0	6.6	Kd	4622.0	6.0	Kd
	4605 9	6.0	Kd	4645.4	4.6	L
	4610.0	5.9	Kd	4649.8	4.9	Bh
103769 R URSAE MAJORIS—						
	4618.7	13.0	Wf	4666.7	12.8	Wf
	4622.7	13.2	Wf	4669.6	13.0	Pt
	4628.7	13.1	Wf	4669.7	12.9	B
	4636.7	13.0	Lv	4669.7	13.0	Lv
	4640.7	13.3	Cy	4672.7	12.8	Wf
	4640.7	13.1	Pt	4674.7	13.0	Lv
	4647.6	13.1	B	4691.7	12.3	Cu
	4648.7	13.0	Wf			
104620 V HYDRAE—						
	4576.0	9.2	B	4619.2	9.9	Ch
	4582.0	9.7	B	4622.1	8.7	Bl
	4589.1	9.6	B	4625.2	9.2	Ch
	4592.2	10.2	Ch	4633.0	8.8	Bl
	4595.3	10.2	Ch	4636.1	9.3	Ch
	4601.0	8.9	Bl	4640.7	8.4	Pt
	4610.2	10.0	Ch	4645.4	8.3	L
	4610.4	8.7	L	4649.1	9.2	Ch
	4611.1	9.7	Ch	4669.6	8.5	Pt
	4612.6	9.0	Bl			
104628 RS HYDRAE—						
	4582.0	13.5	Bl	4622.1	12.7	Bl
104814 W LEONIS—						
	4620.1	10.8	Ch	4647.2	10.4	Ch
	4630.7	9.9	Lv	4649.7	10.3	Lv
	4539.7	9.6	Lv	4654.6	10.0	B
	4639.7	9.9	B	4660.7	10.7	Lv
	4640.7	9.5	Cy	4669.6	11.0	B
	4645.6	9.6	Ba	4669.7	11.0	Lv
	4646.7	10.5	Lv	4674.7	11.1	Lv
110361 RS CARINAE—						
	4585.3	[12.3	Sm	4625.2	[12.3	Sm
110506 S LEONIS—						
	4620.1	9.8	Ch	4647.2	10.1	Ch
	4640.7	10.1	Pt	4669.6	12.5	Pt
	4640.7	10.0	Cy	4674.6	12.7	B
	4645.6	10.1	Ba			
111561 RY CARINAE—						
	4582.0	[13.1	Bl	4622.0	[13.5	Bl
111661 RS CENTAURI—						
	4576.0	9.5	Bl	4601.0	10.9	Bl
	4585.3	9.7	Sm	4622.0	12.7	Bl
	4589.1	10.0	Bl	4625.2	[12.1	Sm
	4592.3	9.9	Sm			
114441 X CENTAURI—						
	4582.0	11.1	Bl	4612.0	9.4	Bl
	4589.1	10.9	Bl	4622.1	8.4	Bl
	4601.0	10.6	Bl			
115058 W CENTAURI—						
	4582.0	12.4	Bl	4612.0	9.8	Bl
	4589.1	11.7	Bl	4622.0	9.3	Bl
	4601.0	10.8	Bl			
115919 R COMAE BERENICES—						
	4618.7	10.4	Wf	4648.6	8.6	Cl
	4620.1	10.8	Ch	4648.7	9.2	Wf
	4636.7	9.5	Lv	4649.7	9.5	Lv
	4637.6	9.0	Ie	4664.7	9.1	Lv
	4637.7	9.0	Wf	4666.7	8.9	Wf
	4640.7	9.2	Pt	4669.6	9.4	Pt
	4644.6	9.2	C	4669.7	9.4	Lv
	4644.6	9.2	Hy	4672.7	9.0	Wf
	4644.6	9.0	Em	4674.6	9.1	B
	4645.6	9.0	Ba	4674.7	9.4	Lv
	4646.7	9.3	Lv	4685.6	9.3	Cl
120012 SU VIRGINIS—						
	4620.1	12.2	Ch	4640.7	12.5	Pt
	4623.6	11.8	B	4645.6	[12.5	Ba
	4623.7	[11.3	Pw	4652.6	13.3	B
	4640.5	[12.4	Ie	4669.6	[13.7	B
120905 T VIRGINIS—						
	4636.7	10.1	Lv	4648.7	10.3	Pc
	4640.7	10.0	Pt	4649.7	10.3	Lv
	4645.6	10.1	Ie	4665.7	10.4	B
	4645 6	10.2	Ba	4669.6	10.4	Pt
	4646.7	10.4	Lv	4674.7	10.7	Lv
121418 R CORVI—						
	4610.5	11.4	L	4653.6	9.3	B
	4621.6	11.1	L	4656.4	9.2	L
	4639.6	10.3	B	4665.6	9.0	B
	4640.7	10.1	Pt	4669.6	8.8	Pt
	4645.6	9.8	Ba			
122001 SS VIRGINIS—						
	4612.6	8.1	L	4644.6	8.7	B
	4623.6	9.1	B	4645.6	8.3	Ba
	4634.6	7.8	L	4666.5	8.0	L
122532 T CANUM VENATICORUM—						
	4627.6	11.2	Cl	4653 6	11.2	Cl
	4640.7	12.3	Pt	4669.6	10.7	Pt
	4645.7	12.3	Ba	4685.6	9.6	Cl
122803 Y VIRGINIS—						
	4616.6	9.6	L	4652.6	9.2	B
	4628.6	8.6	B	4656.4	9.4	L
	4640.6	8.6	Ie	4665.6	9.8	B
	4645.7	9.3	Ba			
122854 U CENTAURI—						
	4576.0	8.9	Bl	4612.0	11.9	Bl
	4589.1	10.2	Bl	4622.0	12.6	Bl
	4601.0	10.6	Bl			
123160 T URSAE MAJORIS—						
	4598.4	8.3	Ch	4640.7	9.9	Cy
	4611.6	8.4	Ls	4642.1	9.3	Ch
	4613.5	8.6	Ls	4645.7	9.6	Ba
	4618.7	8.7	Wf	4648.7	9.6	Wf
	4622.7	8.6	Wf	4648.8	9.8	Jo
	4623.1	8.4	Ch	4652.2	10.2	Ch
	4628.7	8 7	Wf	4666.7	10.4	Wf
	4633.1	8.9	Ch	4669.6	11.1	Pt
	4636.3	9.2	Ro	4669.7	11.1	Lv
	4639.5	9.3	B	4672.7	11.1	Wf
	4639.6	9.5	Pt	4674.8	11.2	Lv

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
123307 R VIRGINIS—						
	4612.6	12.0	L	4644.6	9.5	Hy
	4634.6	10.5	L	4644.6	9.5	C
	4639.6	10.2	Pt	4645.7	9.0	Ba
	4640.6	10.0	Pw	4652.6	8.3	B
	4642.7	9.5	Cy	4666.5	7.3	L
	4644.6	9.4	Em	4669.6	7.2	Pt
123459 RS URSAE MAJORIS—						
	4618.7	14.2	Wf	4669.6	14.0	Pt
	4637.7	14.2	Wf	4669.7	13.9	Lv
	4639.7	13.6	Pt	4670.7	14.2	Wf
	4648.7	14.4	Wf	4674.8	13.8	Lv
	4666.7	14.4	Wf			
123961 S URSAE MAJORIS—						
	4598.4	11.5	Ch	4648.7	9.6	Wf
	4610.5	11.6	L	4648.8	8.9	Jo
	4617.3	11.1	Ro	4650.2	9.4	Ch
	4618.7	11.6	Wf	4653.1	9.9	Jn
	4620.6	11.4	L	4663.6	8.7	L
	4622.7	11.6	Wf	4666.1	9.0	Jn
	4628.7	11.1	Wf	4666.7	8.7	Wf
	4632.6	10.6	Pw	4668.7	8.5	Pw
	4636.3	10.5	Ro	4669.6	8.5	Pt
	4638.2	10.3	Ch	4669.7	8.7	Lv
	4639.6	10.3	B	4670.1	8.8	Jn
	4639.6	10.0	Pt	4670.6	8.4	Kb
	4640.7	9.7	Jo	4670.7	8.5	Jo
	4640.7	10.0	Cy	4670.7	8.5	Wf
	4645.7	9.5	Ba	4674 8	8.7	Lv
	4646.6	10.2	Jn	4676.7	8.4	Jo
	4648.6	10.1	Hs	4681.6	8.5	Kb
	4648.6	10.2	Ci	4685.7	8.3	Jo
	4648.6	10.1	Jn			
124204 RU VIRGINIS—						
	4626.6	11.8	Ie	4643.6	10.9	Cy
	4639.6	12.0	Pt	4645.7	10.5	Ba
	4640.6	10.7	Pw	4669.6	10.4	Pt
124606 U VIRGINIS—						
	4639.6	10.5	Pt	4645.7	10.3	Ba
	4640.6	10.4	Pw	4669.6	9.1	B
	4643.6	10.0	Cy	4669.6	8.6	Pt
130212 RV VIRGINIS—						
	4618.7	10.5	Wf	4648.7	11.4	Wf
	4645.6	11.5	Ie	4666.7	12.6	Wf
	4645.7	11.0	Ba	4672.7	12.6	Wf
131283 U OCTANTIS—						
	4576.0	9.2	Bl	4612.0	8.0	Bl
	4585.3	9.0	Sm	4622.0	8.0	Bl
	4589.1	8.6	Bl	4623.3	8.3	Ht
	4592.3	8.7	Sm	4623.3	7.5	Sm
	4601.0	8.1	Bl	4629.3	8.0	Ht
132002 W VIRGINIS—						
	4640.6	9.6	B	4669.7	10.0	B
	4645.7	10.0	Ba			
132202 V VIRGINIS—						
	4640.6	[13.3	B	4645.7	[12.0	Ba
132422 R HYDRAE—						
	4576.0	7.4	Bl	4622.0	6.9	Bl
	4589.1	7.5	Bl	4623.3	7.3	Sm
	4589.3	7.6	En	4627.3	7.3	En
	4589.3	7.8	Kd	4638.2	6.8	Ch
	4591.3	7.5	Sm	4639.6	6.4	Pt

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
132422 R HYDRAE—Continued.						
	4594.2	7.8	Ch	4641.3	6.4	Be
	4598.3	7.9	Kd	4642.2	6.4	Be
	4599.3	7.7	En	4643.4	6.4	Be
	4601.0	7.1	Bl	4645.4	6.4	Be
	4607.3	7.7	En	4645.4	6.9	L
	4608.2	7.7	Ch	4647.4	6.4	Be
	4610.0	7.5	Kd	4648.3	6.4	Be
	4610.5	6.9	L	4649.4	6.5	Be
	4612.0	7.5	Bl	4652.4	6.5	Be
	4614.0	7.4	Kd	4656.4	5.9	Be
	4618.1	7.3	Kd	4656.4	5.9	L
	4619.4	7.3	En	4663.6	5.7	L
	4621.2	7.2	Ch	4669.7	5.5	Pt
	4621.6	6.6	L			
132706 S VIRGINIS—						
	4591.3	9.6	Sm	4641.7	6.8	Cy
	4594.2	9.7	Ch	4644.6	7.4	B
	4608.2	8.8	Ch	4648.5	7.4	Kb
	4618.7	7.9	Wf	4648.7	7.0	Wf
	4621.2	7.7	Ch	4649.1	6.8	Ch
	4622.7	7.4	Wf	4649.5	7.4	Kb
	4623.3	7.9	Sm	4654.5	6.9	Kb
	4623.6	7.7	Kb	4663.7	6.9	Wf
	4627.6	7.8	B	4667.6	7.4	Kb
	4628.7	7.4	Wf	4669.7	7.7	Pt
	4634.1	7.4	Ch	4670.6	7.5	Kb
	4637.3	6.8	Ro	4670.7	7.5	Wf
	4638.5	7.5	Kb	4674.8	7.4	Wf
	4639.6	7.0	Pt	4681.6	7.8	Kb
133155 RV CENTAURI—						
	4576.0	8.2	Bl	4612.1	8.5	Bl
	4589.1	8.2	Bl	4622.0	8.5	Bl
	4601.0	8.2	Bl			
133273 T URSAE MINORIS—						
	4618.7	12.5	Wf	4669.8	13.5	Lv
	4640.6	13.0	B	4673.7	13.8	Wf
	4648.7	13.0	Wf	4674.8	13 6	Lv
	4668.7	13.6	Wf			
133633 T CENTAURI—						
	4576.0	7.2	Bl	4613.0	6.4	Kd
	4586.1	6.5	Kd	4614.1	6.4	Kd
	4589.1	6.2	Bl	4618.1	6.2	Kd
	4589.3	6.8	En	4618 3	6.2	Ht
	4590.3	6.1	Kd	4619.3	6.7	En
	4591.3	6.3	Sm	4622.0	6.5	Kd
	4595.3	6.7	En	4622.0	6.0	Bl
	4598.3	6.0	Kd	4623.3	6.2	Ht
	4599.3	6 4	En	4623.3	6.7	Sm
	4601.0	5.8	Bl	4627.3	6.5	Ht
	4607.3	6.7	En	4627.3	6.3	En
	4610.0	6.1	Kd	4629.3	6.6	Ht
	4612.1	6.0	Bl	4649.8	7.6	Bh
134236 RT CENTAURI—						
	4582.0	12.2	Bl	4622.0	11.6	Bl
134440 R CANUM VENATICORUM—						
	4630.6	10.9	B	4647.9	10.8	Bi
	4636.7	11.4	Lv	4650.6	10.9	B
	4639.6	11.4	Pt	4663.6	11.5	Cl
	4644.6	10.9	Em	4664.7	11.1	Lv
	4644.6	11.1	Hy	4669.7	10.4	Pt
	4644.6	11.1	C	4671.7	10.5	Lv

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
134536 RX CENTAURI—						
	4582.0	[13.1	Bl	4622.0	[13.1	Bl
134677 T APODIS—						
	4582.0	13.0	Bl	4612.1	10.2	Bl
	4589.9	12.5	Bl	4622.1	9.6	Bl
	4601.0	11.0	Bl	4625.2	10.0	Sm
135908 RR VIRGINIS—						
	4626.6	11.7	Ie	4653.6	11.9	B
	4639.6	11.7	Pt	4669.7	11.8	B
	4640.6	12.0	B	4669.7	11.6	Pt
140113 Z BOOTIS—						
	4618.8	13.9	Wf	4666.7	15.0	Wf
	4622.7	14 1	Wf	4670.7	15.1	Wf
	4648.7	14.6	Wf			
140512 Z VIRGINIS—						
	4675.6	[12.7	Ie			
140528 RU HYDRAE—						
	4576.0	9.0	Bl	4612.0	10.7	Bl
	4589.1	10.4	Bl	4622.0	10.7	Bl
	4591.3	10.1	Sm	4623.3	11.0	En
	4601.0	10.4	Bl	4623 3	11.2	Sm
140959 R CENTAURI—						
	4576.0	6.0	Bl	4612.1	6.0	Bl
	4578.3	6.2	En	4617.2	5.8	En
	4583.3	6.0	En	4618.3	5.8	Ht
	4585.3	6.0	Sm	4622.1	5.9	Bl
	4589.1	5 8	Bl	4623.3	6.1	Ht
	4589.3	5.8	En	4623.3	5.9	Sm
	4591.3	5.5	Sm	4628.3	5.9	En
	4595.3	5.6	En	4629.3	6.1	Ht
	4601.0	5.8	Bl	4635.3	5.9	En
	4607.3	5.8	En			
141567 U URSAE MINORIS—						
	4594.2	10.4	Ch	4640.5	10.7	Cg
	4621.2	10.9	Ch	4653.6	12.0	B
	4632.7	11.1	Pw	4668.6	12.2	B
	4637.1	11.4	Ch	4669.8	12.1	Lv
	4639.6	11.6	B	4669.7	12.5	Pt
	4639.6	12.2	Pt			
141954 S BOOTIS—						
	4596.2	10.7	Ch	4647.6	8.5	B
	4610.5	9.8	L	4648.7	8.4	Wf
	4618.8	9.7	Wf	4658.5	8.5	L
	4620.2	9.4	Ch	4663 7	8.4	Wf
	4620.6	9.1	L	4669.7	8.7	Pt
	4622.7	9.2	Wf	4670.7	8.6	Wf
	4626.6	8.6	Cy	4670.7	8.8	Jo
	4627.6	9.1	B	4674.8	8.7	Wf
	4628.7	8 8	Wf	4676.7	9.0	Jo
	4635.6	8.5	B	4682.8	8.9	Gb
	4639.6	8.3	Pt	4687.8	10.4	Jo
	4642.1	8.0	Ch			
142205 RS VIRGINIS—						
	4640.6	10.8	B	4653.6	11.0	B
142539 V BOOTIS—						
	4596.2	10.0	Ch	4640.6	8.7	Jo
	4610 5	9.5	L	4641.6	8.5	Cy
	4613.5	9.1	Ls	4642.1	8.8	Ch
	4621.2	9.5	Ch	4642.6	8.5	Pc
	4621.6	9.5	L	4647.3	8.9	Ro
	4625.6	9.3	Ls	4647.6	8.5	B
	4626.6	9.3	Cy	4658.5	8 0	L
142539 V BOOTIS—Continued.						
	4627.6	9.3	B	4669.7	7.7	Pt
	4635.6	8.7	B	4670.7	8.0	Jo
	4636.3	9.4	Ro	4676.7	8.0	Jo
	4639.6	8.8	Pt	4685.7	7.6	Jo
142584 R CAMELOPARDALIS—						
	4618 8	8.8	Wf	4648.7	10.7	Wf
	4622.7	8.9	Wf	4649.1	10.6	Ch
	4623.6	9.3	B	4663.7	11.2	Wf
	4628.7	9.5	Wf	4670.7	11.5	Wf
	4647.6	10.5	B	4674.8	11.7	Wf
143227 R BOOTIS—						
	4598.2	7.6	Ch	4633.6	8 0	B
	4611.6	8.2	Ls	4636.3	8.4	Ro
	4613.5	8.2	Ls	4636.7	8.5	Gb
	4621.2	7.8	Ch	4639.6	8.2	Pt
	4621.6	8.1	Ls	4644.5	8.5	O
	4626 6	8.4	Cy	4669.7	10.0	Pt
144918 U BOOTIS—						
	4627.7	11.7	B	4585.7	10.7	Cu
	4641.6	11.4	Cy	4586.7	10.7	Cu
	4650.6	11.8	B	4587.6	10.7	Cu
	4676.6	11.0	Pw	4688.6	10.7	Cu
	4683.7	10.8	Cu			
145254 Y LUPI—						
	4582.0	[13.7	Bl	4622.2	[13.7	Bl
145971 S APODIS—						
	4576.0	10.3	Bl	4612.1	10.0	Bl
	4585.3	9.9	Sm	4617.3	10.0	En
	4589.1	10.3	Bl	4622.2	10.0	Bl
	4591.3	9.9	Sm	4622.3	9.9	En
	4599.3	10.2	En	4625.3	9.9	Sm
	4601.0	10.1	Bl	4627.3	10.0	En
	4611.3	9.8	En	4635.3	10.3	En
150018 RT LIBRAE—						
	4639.6	9.1	Pt	4669.7	11.3	Pt
	4653.7	10.2	B			
150519 T LIBRAE—						
	4640.6	12.9	B	4669.7	11.5	Pt
	4665.6	11.7	B			
150605 Y LIBRAE—						
	4612.6	14.0	L	4673.6	13.1	B
	4644.7	13.8	B			
151520 S LIBRAE—						
	4612.7	11.5	L	4645.2	11.0	Ch
	4639.6	12.0	Pt	4666.5	9.8	L
151714 S SERPENTIS—						
	4616 6	13.6	L	4670.8	11.9	Wf
	4622.7	13.2	Wf	4685.7	11.8	Cu
	4642.7	12.4	Cy	4686.7	12.0	Cu
	4647.6	12.4	B	4687.7	12.2	Cu
	4648.7	12.5	Wf	4688.6	11.9	Cu
	4658.6	12.0	L			
151731 S CORONAE BOREALIS—						
	4610.2	10 2	Ch	4647.7	10.5	Pc
	4618.8	10.6	Wf	4648.6	10.9	Jo
	4620.2	10.4	Ch	4648.7	11.2	Wf
	4622.7	10.7	Wf	4650.6	11.1	B
	4628.7	10.6	Wf	4663.7	12.0	Wf
	4633.7	11.0	B	4665 6	11.9	B
	4636.1	10.9	Ch	4669.7	12.0	Pt
	4640.7	10.6	Pw	4670.8	12.2	Wf

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
151731 S Cor. Borealis—Continued.						
	4641.7	11.6	Cy	4674.8	12.2	Wf
	4643.6	10.7	Jo			
151822 RS Librae—						
	4589.1	11.5	Bl	4623.4	11 7	Sm
	4612.6	11.8	L	4650.6	11.0	B
	4618.4	11.7	Ht	4656.4	10.6	L
	4622.2	11.7	Bl	4668.7	9.9	B
	4623.4	11.7	Ht			
152714 RU Librae—						
	4616.6	13.5	L	4644.7	[13.4	B
	4639.6	13.6	Pt	4673.6	[13.1	B
152849 R Normae—						
	4582.0	12.4	Bl	4622.2	12.8	Bl
	4591.3	12.8	Sm	4623.3	12.8	Sm
153020 X Librae—						
	4622.2	[12.9	Bl			
153215 W Librae—						
	4622.2	[13 5	Bl	4686.7	11.4	Cu
	4673.6	11.5	B	4687.7	11.4	Cu
153378 S Ursae Minoris—						
	4611.2	8.6	Ch	4637.6	9.0	Pw
	4617.3	8 9	Ro	4639.6	8.6	Pt
	4618.8	8.6	Wf	4640.6	9.1	Pw
	4622.7	8.8	Wf	4647 3	10.4	Ro
	4623.7	8.7	Pw	4648.7	9.6	Wf
	4626.6	8.5	Cy	4663.7	10.7	Wf
	4628.7	8.9	Wf	4669.7	10.3	Pt
	4636.3	9.8	Ro	4670.8	10.7	Wf
	4636.1	9 4	Ch	4674.8	10.6	Wf
153620a U Librae—						
	4622.2	10.6	Bl			
153654 T Normae—						
	4592.3	[12.2	Sm	4623.3	11.1	Sm
	4618.3	11.9	Ht	4629.3	11.6	Ht
	4623.3	11.9	Ht			
154020 Z Librae—						
	4622.2	[12.7	Bl			
154428 R Coronae Borealis—						
	4585.3	6.1	Kd	4647.6	6.1	Pt
	4590 3	6.2	Kd	4647.6	6.1	Pw
	4592.2	6.1	Ch	4647.7	5.8	Pc
	4597.3	6.0	Kd	4647.7	5.8	Gb
	4600.2	6.1	Ch	4648.5	6.0	O
	4610.2	6.1	Ch	4648.6	6.8	Cl
	4610.3	5.9	L	4648.6	6.1	Pt
	4610.6	6.2	Kd	4649.5	6.0	Kb
	4611.6	6.0	Ls	4649.8	6.0	Bh
	4611.6	6.0	L	4650.6	6.1	B
	4612.6	6.2	Kd	4650.7	6.1	Pt
	4613.5	6.7	Ls	4651.7	5.8	Pc
	4614.7	6.2	Kd	4651.8	6.0	Pt
	4614.4	6.1	Ch	4652.7	6.1	Pt
	4616.6	6.1	L	4653.6	6.1	Pt
	4617.5	6.0	Ro	4656.6	6.0	Pt
	4618.8	5.9	Wf	4656.6	6.4	Pw
	4619.2	6.0	Ch	4658.6	6.1	L
	4620.6	6.0	L	4658.9	6.0	Pt
	4621.6	6.0	L	4659.6	6.0	Pt
	4621.7	5.9	Cy	4660.6	6.0	Pt
	4622 0	6.3	Kd	4663.6	6.1	Pt
	4622.7	5.9	Wf	4663.7	6.2	Wf
154428 R Cor. Borealis—Continued.						
	4623.2	6.1	Ch	4664.6	6.1	Pt
	4623.7	6.2	Pw	4665.6	5.8	B
	4625.2	6.0	Ch	4665.7	6.1	Pt
	4625.6	6.1	Pt	4666.5	6.0	L
	4626.6	6.2	Ie	4666.7	6.0	Pt
	4626.6	6.0	Cy	4666.7	6.0	Wf
	4626.6	6.1	Pt	4668.6	6.0	B
	4627.4	6.0	Ch	4668.7	6.0	Pt
	4628 7	6.1	Wf	4669.7	6.0	Pt
	4631.7	6.1	Pt	4670.6	6.0	Cu
	4632.6	6.1	Pt	4670.6	6.0	Jo
	4632.7	6.1	Pw	4670.6	6.1	Cm
	4634.6	6.1	Pt	4670.6	6.0	Kb
	4634.6	6.0	L	4670.7	6.1	Pt
	4635.6	6.1	Pt	4670.8	6.1	Wf
	4636.6	6.0	Gb	4671.7	6.1	Pt
	4636.7	6.0	Pt	4672.7	6.1	Pt
	4636.7	6.1	Pw	4672.8	6.1	Wf
	4637.6	6.2	Ie	4673.7	6.1	Pt
	4637.6	6.2	Pw	4674.8	6.1	Pt
	4637.6	5.8	Jo	4674.8	6.1	Wf
	4637.8	6.0	Pt	4675.6	6.3	Ie
	4639.6	6.1	Pt	4675.8	6.0	Pt
	4639.6	6.3	B	4676.7	6.1	Cu
	4640.5	5.6	Cg	4676.7	6.0	Jo
	4640.6	5.8	Jo	4676.7	6.0	Pt
	4640.7	6.3	Cy	4677.5	6.0	O
	4640.7	6.1	Pw	4677.6	6.1	Pt
	4640.7	6 1	Pt	4679.7	6.1	Pt
	4641.6	6.4	Cy	4680.6	6.2	Ie
	4641.6	6.1	Pt	4681.6	6.0	Kb
	4641.7	5.8	Pt	4682.7	6.1	Pw
	4642.1	6.0	Ch	4682.8	6.0	Gb
	4642.6	6.3	Cy	4683.6	6 3	Pw
	4642.6	6.1	Pt	4683.6	6.0	Cu
	4642.6	5.8	Pc	4683.7	6.1	Pt
	4643.6	6.3	Cy	4684.7	6.1	Pt
	4643.7	6.0	Pt	4685.6	6.0	Pt
	4644.5	6 0	O	4685.6	6.1	Cu
	4644.6	6.3	Cy	4686.7	6.0	Cm
	4644.7	5.8	Pc	4686.7	6.0	Cu
	4644.8	6.1	Pt	4687.6	6.0	Cm
	4645.4	6.1	L	4687.8	6.0	Cu
	4645.7	6.0	Ba	4688.6	6 0	Cu
	4646.6	6.1	Pt	4692.6	6.0	Cu
	4647.2	6.0	Ch			
154536 X Coronae Borealis—						
	4637.6	9.7	Ie	4650.7	9.0	Wf
	4639.6	9.5	Pt	4669.7	9.5	Pt
	4642.6	9.1	Cy	4670.8	9.4	Wf
154615 R Serpentis—						
	4594.2	7.6	Ch	4642.7	8.8	Cy
	4619.2	8.0	Ch	4644.5	8.7	O
	4636.1	8.8	Ch	4651.1	9.1	Ch
	4639.6	8.8	Pt	4668.6	9.8	B
	4640.7	9 0	B	4669.7	10.0	Pt
154639 V Coronae Borealis—						
	4627.7	9.5	B	4644.6	9.6	B
	4635.7	9.0	B	4650.7	9.8	Wf
	4639.6	8.7	Pt	4669.7	8.3	Pt
	4642.6	10.0	Cy	4670.8	9.5	Wf

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
154715 R LIBRAE—						
	4650.7	[13.0	B	4673.7	13.0	B
155018 RR LIBRAE—						
	4601.5	10.4	Ch	4637.2	9.0	Ch
	4610.2	9.8	Ch	4639.6	9.0	Pt
	4611.6	10.2	L	4645.2	8.9	Ch
	4620.2	9.4	Ch	4658.6	8.8	L
	4621.6	9.4	L	4669.7	9.1	Pt
155229 Z CORONAE BOREALIS—						
	4637.6	[12.5	Ie	4686.7	11.5	Cu
	4639.6	[13.6	B	4687.7	11.3	Cu
	4685.7	11.4	Cu	4688.7	11.3	Cu
155823 RZ SCORPII—						
	4611.4	10.5	En	4623.4	11.5	Sm
	4618.4	10.4	Ht	4639.6	12.0	Pt
	4623.3	10.9	En	4669.7	12.7	Pt
	4623.4	11.2	Ht			
160021 Z SCORPII—						
	4612.1	12.0	Bl	4622.2	12.1	Bl
	4612.6	11.9	L	4666.5	12.2	L
160118 R HERCULIS—						
	4647.6	[13.5	B	4665.6	[13.4	B
160210 U SERPENTIS—						
	4639.6	13.2	Pt	4669.7	9.9	Pt
	4642.7	11.8	Cy	4677.6	9.2	Pw
	4647.7	11.8	B	4683.6	9.2	Ie
	4665.6	10.3	B			
160221a X SCORPII—						
	4622.2	[13.0	Bl			
160325 SX HERCULIS—						
	4611.6	9.0	L	4658.9	8.0	Pt
	4618.8	9.3	Wf	4659.6	8.0	Pt
	4621.6	9.0	L	4660.6	8.1	Pt
	4622.7	9.4	Wf	4663.6	8.0	Pt
	4625.6	8.6	Pt	4664.6	7.9	Pt
	4626.6	8.5	Pt	4665.7	7.8	Pt
	4631.7	8.2	Pt	4666.5	7.8	L
	4634.6	8.0	Pt	4666.7	7.8	Pt
	4634.6	8.3	L	4666.8	8.3	Wf
	4635.6	8.0	Pt	4668.7	8.0	Pt
	4636.7	8.0	Pt	4669.7	7.8	Pt
	4639.6	8.0	Pt	4670.7	7.9	Pt
	4640.7	8.0	Pt	4670.8	8.1	Wf
	4641.6	8.2	Pt	4671.7	8.0	Pt
	4642.6	8.1	Pt	4672.7	8.0	Pt
	4643.7	8.1	Pt	4673.7	7.9	Pt
	4646.6	8.0	Pt	4674.8	7.9	Pt
	4647.6	8.0	Pt	4675.8	7.9	Pt
	4648.6	8.0	Pt	4676.7	8.0	Pt
	4650.7	8.0	Pt	4677.6	8.0	Pt
	4650.7	8.1	Wf	4679.7	8.0	Pt
	4652.7	8.0	Pt	4683.7	8.0	Pt
	4656.4	7.8	Be	4684.6	8.0	Pt
	4656.4	7.7	L	4685.6	8.0	Pt
	4656.6	7.8	Pt			
160519 W SCORPII—						
	4622.2	13.0	Bl			
160625 RU HERCULIS—						
	4616.6	12.0	L	4650.7	12.7	Wf
	4618.8	12.0	Wf	4666.8	13.1	Wf
	4622.7	12.1	Wf	4668.6	13.4	B
160625 RU HERCULIS—Continued.						
	4639.6	12.5	Pt	4670.8	13.1	Wf
	4647.6	13.0	B			
161122a R SCORPII—						
	4612.1	[12.6	Bl	4686.7	[13.2	Cu
	4622.2	[13.0	Bl			
161122b S SCORPII—						
	4612.1	12.6	Bl	4640.7	13.3	Pt
	4622.2	12.8	Bl	4686.7	[13.2	Cu
161122c T SCORPII—						
	4677.6	9.8	Pw			
161138 W CORONAE BOREALIS—						
	4622.8	9.3	Wf	4650.7	9.0	Wf
	4628.7	9.2	Wf	4663.7	9.1	Wf
	4637.6	8.7	Ie	4670.6	9.6	Pt
	4640.7	9.0	B	4670.8	9.5	Wf
	4640.7	8.7	Pt	4674.8	9.7	Wf
	4641.7	9.3	Pc			
161607 W OPHIUCHI—						
	4616.2	[11.4	Ch	4642.7	[13.5	B
	4616.6	[14.5	L	4668.6	[13.8	B
162112 V OPHIUCHI—						
	4623.2	10.3	Ch	4670.6	9.6	Pt
	4640.7	10.0	Pt			
162119 U HERCULIS—						
	4610.2	11.5	Ch	4650.2	10.8	Ch
	4616.4	11.3	Kl	4650.7	10.7	Wf
	4618.8	11.2	Wf	4653.7	10.2	B
	4620.2	11.4	Ch	4656.6	9.3	Jo
	4622.4	12.2	Kl	4663.8	10.0	Wf
	4622.7	11.0	Wf	4665.6	9.9	B
	4637.6	10.7	Jo	4670.6	9.4	Jo
	4640.6	10.0	Jo	4670.6	9.3	Pt
	4640.7	10.7	Pt	4670.8	9 8	Wf
	4643.4	10.6	Kl	4674.8	9.6	Wf
	4644.5	11.2	O	4683.6	9.6	Ie
	4645.2	11.0	Ch	4685.7	9.0	Jo
	4647.7	10.5	B	4687.6	9.2	Cm
	4649.8	11.0	Bh			
162807 SS HERCULIS—						
	4611.6	9.5	L	4656.4	12.0	L
	4621.6	9.1	L	4670.6	12.2	Pt
	4640.7	10.3	Pt	4683.6	12.0	Ie
162815 T OPHIUCHI—						
	4612.6	10.0	L	4666.5	11.3	L
	4622.2	9.6	Bl	4668.6	11.6	B
	4640.7	10.8	Pt	4670.6	11.5	Pt
162816 S OPHIUCHI—						
	4612.6	[14.0	L	4652.7	13.4	B
	4622.2	[13.2	Bl	4673.7	[13.6	B
163137 W HERCULIS—						
	4596.3	8.1	Ch	4651.1	9.8	Ch
	4610.2	8.2	Ch	4651.7	9.8	Pc
	4619.2	8.6	Ch	4654.6	10.4	B
	4636.1	9.0	Ch	4670.6	11.0	Pt
	4640.7	9.6	Pt	4680.6	11.4	Ie
	4641.7	9.6	Pc			
163172 R URSAE MINORIS—						
	4647.6	9.5	B			
163266 R DRACONIS—						
	4594.2	7.0	Ch	4644.4	8.4	Ch
	4615.2	7.4	Ch	4648.6	8.3	Jo

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
163266 R DRACONIS—Continued.						
	4630.4	7.9	Ch	4656.6	8.5	Jo
	4637.6	8.0	Jo	4670.6	9.3	Pt
	4640.7	8.0	Pt	4670.7	9.3	Jo
	4643.6	8.2	Jo			
164319 RR OPHIUCHI—						
	4640.7	12.5	Pt	4670.6	12.0	Pt
	4658.6	12.6	L	4674.6	11.8	B
164715 S HERCULIS—						
	4620.2	7.8	Ch	4648.8	8.3	Jo
	4640.6	8.3	Jo	4670.6	8.7	Jo
	4640.7	8.2	Pt	4670.6	9.5	Pt
	4643.8	8.1	Jo	4677.7	9.1	Jo
	4645.2	8.2	Ch	4683.6	9.6	Ie
164844 RS SCORPII—						
	4612.1	8.6	Bl	4623.3	9.4	Sm
	4618.4	9.4	Ht	4623.4	9.4	Ht
	4622.2	8.5	Bl	4629.3	9.6	Ht
165030 RR SCORPII—						
	4612.1	11.2	Bl	4622.2	11.6	Bl
165202 SS OPHIUCHI—						
	4640.7	13.1	Pt	4677.5	9.6	O
165631 RV HERCULIS—						
	4640.6	11.4	Jo	4668.6	12.6	B
	4640.7	11.7	Pt	4670.6	12.6	Pt
	4643.6	11.6	Jo	4671.8	13.2	Lv
	4644.5	11.5	O	4676.6	13.3	Cl
	4647.9	11.5	Bi	4679.7	13.5	Bi
	4648.6	11.5	Jo	4685.6	13.6	Cl
	4664.8	12.5	Lv			
170215 R OPHIUCHI—						
	4601.4	7.0	Ch	4648.8	8.9	Jo
	4610.2	7.6	Ch	4650.2	9.0	Ch
	4624.2	7.8	Ch	4670.6	10.5	Cm
	4640.7	8.6	Pt	4670.6	10.0	Pt
	4640.8	8.7	Jo	4678.7	10.6	Jo
	4644.4	8.4	Ch	4683.8	10.8	Jo
170627 RT HERCULIS—						
	4618.8	12.9	Wf	4670.8	14.4	Wf
	4650.8	13.9	Wf	4674.6	[13.4	B
170833 RW SCORPII—						
	4612.1	[12.5	Bl			
171401 Z OPHIUCHI—						
	4640.7	11.8	Pt	4665.6	12.5	B
	4653.6	11.9	B	4670.6	12.6	Pt
171723 RS HERCULIS—						
	4618.8	12.3	Wf	4666.8	10.3	Wf
	4640.7	12.0	Pt	4670.6	9.6	Pt
	4650.8	11.4	Wf	4673.8	9.8	Wf
	4653.6	11.0	B	4677.6	9.5	Pw
	4665.6	10.1	B	4682.7	9.6	Pw
172486 S OCTANTIS—						
	4582.0	13.2	Bl	4622.3	12.5	Bl
	4618.3	[12.1	Ht			
172809 RU OPHIUCHI—						
	4640.7	9.5	Pt	4677.5	9.7	O
	4650.7	9.7	B	4677.6	10.1	Pw
	4668.7	9.8	B	4682.7	10.1	Pw
	4670.6	9.5	Pt			
173411 RT SERPENTIS—						
	4611.7	10.3	L	4621.6	10.4	L
173543 RU SCORPII—						
	4622.2	12.3	Bl			
174135 SV SCORPII—						
	4622.2	[12.2	Bl			
174162 W PAVONIS—						
	4582.0	10.5	Bl	4622.3	12.2	Bl
	4589.9	10.8	Bl	4623.4	[12.3	Ht
	4601.0	11.5	Bl			
174406 RS OPHIUCHI—						
	4640.7	11.2	Pt	4670.6	11.0	Pt
174551 U ARAE—						
	4623.3	[12.3	Sm			
175111 RT OPHIUCHI—						
	4674.6	13.3	B			
175458a T DRACONIS—						
	4618.8	11.5	Wf	4670.8	12.2	Wf
	4650.8	11.6	Wf	4674.8	12.2	Wf
	4663.8	11.9	Wf	4668.6	11.8	B
175458b UY DRACONIS—						
	4650.8	10.9	Wf	4670.8	10.9	Wf
	4663.8	10.9	Wf	4674.8	10.9	Wf
	4668.6	10.8	B			
175519 RY HERCULIS—						
	4598.4	9.9	Ch	4648.2	8.9	Ch
	4620.3	8.5	Ch	4650.2	9.3	Ch
	4625.2	8.4	Ch	4670.6	10.2	Pt
	4640.7	9.0	Pt	4674.8	11.0	Lv
	4647.9	9.2	Bi	4679.7	11.2	Bi
175654 V DRACONIS—						
	4642.8	11.6	Pt	4670.6	10.5	Pt
180363 R PAVONIS—						
	4618.4	[11.9	Ht	4623.4	[11.9	Ht
	4623.3	[11.9	Sm			
180531 T HERCULIS—						
	4622.7	12.8	Wf	4663.8	7.8	Wf
	4612.6	12.6	L	4666.5	7.6	L
	4642.8	10.8	Pt	4670.6	7.2	Jo
	4643.7	10.0	Jo	4670.6	7.5	Pt
	4645.2	10.8	Ch	4670.8	7.7	Wf
	4648.7	9.6	Jo	4674.8	7.4	Wf
	4649.8	9.4	Bh	4677.7	7.5	Jo
	4650.8	9.4	Wf	4680.7	7.6	Ie
	4653.7	9.3	B	4687.6	8.0	Cm
180565 W DRACONIS—						
	4642.8	13.0	Pt	4670.6	13.8	Pt
	4669.8	14.0	Bi			
180666 X DRACONIS—						
	4669.8	13.5	Bi			
180911 NOVA OPHIUCHI—						
	4642.8	[13.0	Pt	4670.7	[13.0	Pt
181031 TV HERCULIS—						
	4612.6	11.2	L			
181103 RY OPHIUCHI—						
	4619.9	9.3	Wf	4670.8	13.8	Wf
	4642.8	12.2	Pt	4672.7	13.9	Wf
	4650.8	12.8	Wf	4674.8	14.0	Wf
	4663.8	13.4	Wf	4670.7	13.6	Pt
181136 W LYRAE—						
	4612.6	7.9	L	4663.8	9.5	Wf
	4622.7	8.0	Wf	4670.6	9.7	Jo
	4634.6	8.3	L	4670.6	9.9	B
	4637.7	8.3	Jo	4670.8	10.0	Wf

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
181136 W LYRAE—Continued.						
	4641.7	8.2	Gb	4672.7	10.1	Wf
	4642.8	8.6	Pt	4673.7	10.2	Wf
	4643.7	8.4	Jo	4674.8	10.2	Wf
	4648.7	8.5	Jo	4676.6	10.1	Cl
	4650.8	8.7	Wf	4677.5	10.5	O
	4656.6	8.8	Jo	4685.6	11.0	Cl
	4663.6	9.4	L			
182133 RV SAGITTARII—						
	4622.2	12.8	Bl			
182224 SV HERCULIS—						
	4611.6	11.1	L	4663.6	12.0	L
	4621.6	10.4	L	4670.7	11.2	Pt
	4642.8	10 2	Pt			
182306 T SERPENTIS—						
	4668.7	12.5	B	4682.7	[11.8	Pw
183308 X OPHIUCHI—						
	4611.6	8.4	L	4670.7	8.6	Pt
	4621.6	8.7	L	4677.5	9.1	O
	4642.8	8.6	Pt	4678.7	8.4	Jo
	4663.6	8.6	L	4685.7	8 3	Jo
	4670.7	8.5	Jo			
184074 RS DRACONIS—						
	4644.4	11.0	Ch			
184134 RY LYRAE—						
	4682.8	[11.7	Pw			
184205 R SCUTI—						
	4585.3	6.5	Kd	4668.7	5.8	Gb
	4590.3	6.6	Kd	4668.7	5.6	Pt
	4596.5	7.0	Ch	4669.7	5.2	Pt
	4597.3	7.1	Kd	4670.7	5.6	Pt
	4598.3	7.1	Kd	4670.7	5.3	Cu
	4599.3	6.9	Kd	4670.6	5.5	Kb
	4611.6	6.5	L	4670.8	5.7	Cm
	4614.4	6 3	Ch	4672.7	5.5	Pt
	4620.6	5.9	L	4673.7	5.5	Pt
	4621.9	5.5	Cy	4674.8	5.5	Pt
	4622.3	5.4	Kd	4675.7	5.5	Ie
	4625.9	5.8	Pt	4675.8	5.6	Pt
	4627.4	5.7	Ch	4576.7	5.5	Pt
	4634.6	5.3	L	4676.7	5.3	Cu
	4637.8	5.0	Pt	4677.6	5.5	Pt
	4640.8	5.6	Cy	4678.7	5.5	Jo
	4642.7	6.4	Cy	4679.7	5.5	Pt
	4642.8	5.7	Pt	4681.6	5.4	Kb
	4643.8	5.7	Pt	4682.8	5.8	Gb
	4644.8	5.8	Pt	4683.6	5.5	Ie
	4646.9	5.8	Pt	4683.7	5.1	Pt
	4647.3	5.7	Ch	4683.8	5.0	Jo
	4647.8	5.9	Pt	4685.6	5 2	Cu
	4649.8	5.8	Pt	4685.6	5.1	Pt
	4650.7	5.9	Pt	4686.7	5.4	Cm
	4658.5	5.8	L	4686.8	5.3	Cu
	4658.7	5.8	Pt	4686.8	5.2	Io
	4663.6	5 6	L	4687.8	5.2	Cu
184243 RW LYRAE—						
	4674.7	[14.0	B			
184300 NOVA AQUILAE—						
	4614.4	10.5	Ch	4650.7	11.0	Pt
	4625.9	11.0	Pt	4658.9	11.0	Pt
	4637.8	10.8	Pt	4668.7	11.0	Pt
	4642.8	10.9	Pt	4674.8	11.0	Pt
184300 NOVA AQUILAE—Continued.						
	4644.8	11.0	Pt	4683.7	11.0	Pt
	4649.2	10.5	Ch	4683.6	10.5	Ie
185032 RX LYRAE—						
	4614.4	[12.5	Ch			
185437a S CORONAE AUSTRALIS—						
	4622.2	12.0	Bl			
185512a ST SAGITTARII—						
	4598.4	11.0	Ch	4627.4	8.4	Ch
	4611.6	8.9	L	4642.4	8.2	Ch
	4614.4	8.9	Ch	4658.6	8 4	L
	4621.6	8.6	L	4686.8	9.9	Cu
185537a R CORONAE AUSTRALIS—						
	4622.2	[12.5	Bl			
185537b T CORONAE AUSTRALIS—						
	4622.2	[12.5	Bl			
185634 Z LYRAE—						
	4674.7	13.3	B			
185737 RT LYRAE—						
	4614.4	[12.0	Ch			
190108 R AQUILAE—						
	4601.5	9.4	Ch	4645.2	11.4	Ch
	4642.8	11.2	Pt	4670.7	11.1	Pt
190529a V LYRAE—						
	4642.8	12.3	Pt	4691.6	9.7	Cu
	4670.7	9.9	Pt			
190818 RX SAGITTARII—						
	4598.4	[10.8	Ch	4614.4	[11.1	Ch
190819a RW SAGITTARII—						
	4595.5	9.7	Ch	4627.4	10.6	Ch
	4598.4	9.7	Ch	4642.8	11.5	Pt
	4614.4	9.9	Ch	4670.7	10.2	Pt
190907 TY AQUILAE—						
	4642.8	10.5	Pt	4670.7	10.3	Pt
190925 S LYRAE—						
	4614.4	[11.6	Ch	4669.8	14.0	Bi
	4668.7	[13.7	B			
190926 X LYRAE—						
	4670.7	9.0	Pt			
190933a RS LYRAE—						
	4614.4	[11.8	Ch	4669.9	[14.0	Bi
	4642.8	14.0	Pt			
190967a U DRACONIS—						
	4642.8	10 0	Pt	4652.3	10.0	Ch
	4644.4	10.4	Ch	4670.7	9.8	Pt
191007 W AQUILAE—						
	4601.5	[10.8	Ch	4642.8	13.1	Pt
191017 T SAGITTARII—						
	4614.4	[11.0	Ch	4670.7	11.2	Pt
	4642.8	12.1	Pt			
191019 R SAGITTARII—						
	4598.4	7.7	Ch	4642.8	10.1	Pt
	4614.4	8 5	Ch	4670.7	11.4	Pt
	4627.4	9.8	Ch			
191033 RY SAGITTARII—						
	4595.5	6.5	Ch	4658.9	6.7	Pt
	4599.3	6.6	Kd	4663.6	6.2	L
	4611.7	6.7	L	4670.7	6.3	Cu
	4621.6	6.6	L	4672.7	6.3	Pt
	4622.2	6 3	Bl	4673.7	6.3	Pt
	4622.4	6.5	Ch	4674.8	6.4	Pt
	4625.9	6.4	Pt	4675.8	6.2	Pt

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
191033 RY SAGITTARII—Continued.						
	4627.4	6.5	Ch	4676.7	6.9	Cu
	4642.8	6.6	Pt	4679.7	6.3	Pt
	4643.8	6.6	Pt	4686.8	7.0	Cu
	4644.8	6.6	Pt	4686.8	6.8	Jo
	4647.8	6.7	Pt	4687.8	7.0	Cu
	4658.6	6.4	L			
191124 TY SAGITTARII—						
	4622.3	[12.4	Bl			
191319 S SAGITTARII—						
	4622.3	[12.9	Bl			
191331 SW SAGITTARII—						
	4622.3	[10.9	Bl			
191350 TZ CYGNI—						
	4642 8	10.0	Pt	4670.7	9.9	Pt
191637 U LYRAE—						
	4642.8	10.1	Pt	4677.5	10.8	O
	4670.7	10.4	Pt			
192928 TY CYGNI—						
	4614.4	[11.9	Ch			
193311 RT AQUILAE—						
	4598.4	9.9	Ch	4642.8	11.2	Pt
	4623.4	10.7	Ch	4670.7	13.0	Pt
193449 R CYGNI—						
	4512.6	11.1	Ch	4627.4	12 0	Ch
	4541.6	9.5	Pj	4640.8	12.1	Cy
	4542.6	8.5	Pj	4650.8	12.4	Wf
	4598.4	11.1	Ch	4663.8	12.8	Wf
	4614.4	11.5	Ch	4669.9	12.6	Bi
	4622.8	11.5	Wf	4670.8	12.6	Wf
	4623.4	11.9	Ch	4672.7	12.6	Pt
	4625.9	11.5	Pt	4674.8	12.9	Wf
193509 RV AQUILAE—						
	4672.7	10.8	Pt			
193972 T PAVONIS—						
	4575.9	10.0	Bl	4601.0	11.7	Bl
	4589.9	11.3	Bl	4622.3	13.0	Bl
194048 RT CYGNI—						
	4598.4	6.5	Ch	4647.7	7.9	Gb
	4614.4	6.3	Ch	4648.5	7.9	Kb
	4620.5	6.9	Kb	4648.8	7.5	Jo
	4623.4	6.9	Ch	4649.5	8.0	Kb
	4623.6	7.1	Kb	4652.4	7.8	Ch
	4625.9	6.6	Pt	4654.5	8 5	Kb
	4627.4	6.6	Ch	4656.7	8.0	Jo
	4638.5	7.4	Kb	4668.7	8.8	Gb
	4640.8	7.3	Jo	4669.9	8.5	Bi
	4640.8	7.2	Cy	4670.7	8.5	Jo
	4642.4	6 9	Ch	4672.7	9.2	Pt
	4643.8	7.3	Jo	4676.7	9.3	Jo
194348 TU CYGNI—						
	4598.2	9.6	Ch	4625.9	11.2	Pt
	4614.4	10.4	Ch	4627.4	11.3	Ch
	4623.4	11.2	Ch			
194604 X AQUILAE—						
	4619.9	13.1	Wf	4650.8	14.2	Wf
	4625.9	13.0	Pt	4670.8	15.0	Wf
194632 χ CYGNI—						
	4585.3	5.8	Kd	4627.4	6.6	Ch
	4590.3	6.2	Kd	4645.2	8.1	Ch
	4597.3	6.2	Kd	4650.8	8.3	Wf
	4598.3	6.2	Kd	4652.2	8.6	Ch
194632 χ CYGNI—Continued.						
	4595.5	5.5	Ch	4663.8	9.3	Wf
	4601.5	5.6	Ch	4670.7	9.5	Cm
	4622.4	6.8	Ch	4670.8	9.6	Wf
	4622.8	6.9	Wf	4672.7	9.5	Pt
	4625.9	6.5	Pt	4674.8	9.7	Wf
194939 RR SAGITTARII—						
	4622.3	13.0	Bl			
195142 RU SAGITTARII—						
	4622.3	7.2	Bl			
195553 NOVA CYGNI, 1920—						
	4625.9	12.9	Pt	4650.7	12.7	Pt
	4643.7	12.8	Pt	4673.7	13.0	Pt
195849 Z CYGNI—						
	4598.4	11.4	Ch	4666.8	13.7	Wf
	4625.9	12.2	Pt	4673.7	13.7	Wf
	4650.8	13.8	Wf	4673.7	12.5	Pt
195855 S TELESCOPII—						
	4622.3	13.1	Bl			
200212 SY AQUILAE—						
	4611.6	11.0	L	4666.5	12.5	L
	4621.6	11.4	L	4673.7	12.8	Pt
	4625.9	11.8	Pt			
200357 S CYGNI—						
	4622.8	15.0	Wf	4670.8	13.0	Wf
	4648.8	13.8	Wf	4673.7	12.3	Pt
	4663.8	13.1	Wf	4674.8	12.7	Wf
	4669.9	12.6	Bi			
200514 R CAPRICORNI—						
	4620.4	11.5	Ch	4673.7	13.0	Pt
	4625.9	11.9	Pt			
200715a S AQUILAE—						
	4619.9	11.2	Wf	4663.8	9.7	Wf
	4622.4	10.4	Ch	4670.8	9.7	Wf
	4625.9	10.7	Pt	4674.8	9.8	Wf
	4627.4	10.4	Ch	4675.7	9.7	Pt
	4650.8	10.0	Wf			
200715b RW AQUILAE—						
	4625.9	9.2	Pt	4675.7	9.1	Pt
200747 R TELESCOPII—						
	4622.3	11.0	Bl			
200822 W CAPRICORNI—						
	4622.3	[12.8	Bl			
200906 Z AQUILAE—						
	4625.9	12.0	Pt	4675.7	13.1	Pt
200916 R SAGITTAE—						
	4686.6	9.9	Cu	4688.6	9.7	Cu
	4687.7	10.0	Cu	4691.6	9.4	Cu
200938 RS CYGNI—						
	4595.5	7.2	Ch	4642.4	7.2	Ch
	4596.5	7.3	Ch	4642.8	7.2	Pt
	4598.4	7.2	Ch	4645.3	7.4	Ch
	4599.4	7.2	Ch	4647.3	7.3	Ch
	4611.6	7.3	L	4647.7	7.4	Gb
	4614.4	7.2	Ch	4650.2	7.4	Ch
	4620.4	7.2	Ch	4652.2	7.5	Ch
	4621.6	7.2	L	4658.5	7.3	L
	4623.4	7.2	Ch	4668.7	7.2	Gb
	4627.4	7.3	Ch	4670.7	7.8	Jo
	4630.4	7.3	Ch	4675.7	7.3	Pt
	4640.8	7.2	Cy	4676.7	7.6	Jo
	4640.8	7.3	Jo			

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.C.D.	Est.	Obs.	J.C.D.	Est.	Obs.
201008 R DELPHINI—						
	4611.6	9.1	L	4666.5	8.1	L
	4621.6	8.8	L	4673.7	8.6	Pt
	4627.4	8.5	Ch	4683.7	8.8	Jo
	4642.8	8.1	Pt			
201121 RT CAPRICORNI—						
	4625.9	6.5	Pt	4673.7	6.7	Pt
201130 SX CYGNI—						
	4642.8	13.7	Pt	4673.7	13.1	Pt
201139 RT SAGITTARII—						
	4622.3	10.6	Bl			
201437b WX CYGNI—						
	4598.4	11.6	Ch	4642.8	11.5	Pt
	4614.4	11.7	Ch	4673.7	12.3	Pt
	4640.8	12.3	Cy			
201647 U CYGNI—						
	4512.6	8.0	Pj	4670.7	8.7	Jo
	4622.4	9.2	Ch	4674.8	9.0	Pt
	4627.4	9.3	Ch	4677.5	9.0	Jo
	4641.7	8.4	Gb	4682.8	9.4	Gb
	4642.8	8.4	Pt	4686.6	9.6	Cm
	4670.7	9.5	Cm			
202240 U MICROSCOPII—						
	4622.3	[13.6	Bl			
202817 Z DELPHINI—						
	4642.8	10.8	Pt			
202946 SZ CYGNI—						
	4625.9	9.8	Pt	4664.6	9.1	Pt
	4631.7	9.0	Pt	4665.7	9.3	Pt
	4634.7	9.4	Pt	4666.7	9.2	Pt
	4637.8	9.3	Pt	4668.7	9.5	Pt
	4639.7	9.8	Pt	4669.7	9.7	Pt
	4640.7	9.4	Pt	4670.7	9.7	Pt
	4641.6	9.4	Pt	4671.7	9.7	Pt
	4642.8	9.4	Pt	4672.7	9.4	Pt
	4643.7	9.5	Pt	4673.7	9.2	Pt
	4644.8	9.7	Pt	4674.8	9.2	Pt
	4646.9	8.8	Pt	4675.8	9.0	Pt
	4647.6	9.0	Pt	4676.7	8.8	Pt
	4650.7	9.4	Pt	4677.6	9.0	Pt
	4652.7	9.4	Pt	4679.7	9.5	Pt
	4656.6	9.6	Pt	4683.7	9.5	Pt
	4658.9	9.4	Pt	4684.6	9.6	Pt
	4663.6	9.3	Pt			
202954 ST CYGNI—						
	4642.8	13.5	Pt	4674.8	13.0	Pt
203226 V VULPECULAE—						
	4642.8	8.8	Pt	4674.8	8.6	Pt
203429 R MICROSCOPII—						
	4622.3	10.4	Bl			
203816 S DELPHINI—						
	4643.8	11.9	Pt	4674.8	12.3	Pt
203847 V CYGNI—						
	4595.5	8.5	Ch	4650.8	8.5	Wf
	4599.4	8.4	Ch	4651.3	9.0	Ch
	4614.4	8.8	Ch	4663.8	9.2	Wf
	4622.4	8.8	Ch	4670.8	9.4	Wf
	4622.8	8.4	Wf	4674.8	9.5	Wf
	4627.4	8.8	Ch	4674.8	8.4	Pt
	4643.8	8.0	Pt			
203905 Y AQUARII—						
	4620.4	[10.8	Ch			
204016 T DELPHINI—						
	4619.9	14.2	Wf	4666.8	10.2	Wf
	4643.8	12.4	Pt	4673.7	9.6	Wf
	4650.8	12.0	Wf	4674.8	9.5	Pt
204102 V AQUARII—						
	4643.8	9.2	Pt	4674.8	8.0	Pt
204104 W AQUARII—						
	4658.6	9.6	L			
204215 U CAPRICORNI—						
	4622.3	[13.1	Bl			
204405 T AQUARII—						
	4596.5	8.0	Ch	4642.4	7.4	Ch
	4614.4	7.9	Ch	4643.8	9.5	Pt
	4620.4	8.2	Ch	4674.8	12.0	Pt
	4627.4	8.5	Ch			
204846 RZ CYGNI—						
	4643.8	10.6	Pt	4673.7	11.5	Wf
	4650.8	11.0	Wf	4674.8	11.0	Pt
	4666.8	11.1	Wf			
204954 S INDI—						
	4622.3	7.9	Bl			
205017 X DELPHINI—						
	4643.8	11.2	Pt	4674.8	9.5	Pt
205923a R VULPECULAE—						
	4619.9	13.1	Wf	4670.8	9.0	Jo
	4643.8	11.7	Pt	4672.7	8.7	Wf
	4650.8	10.8	Wf	4673.7	8.8	Wf
	4663.8	10.1	Wf	4674.8	8.8	Wf
	4666.8	9.6	Wf	4674.8	8.4	Pt
	4670.8	9.1	Wf	4683.7	8.0	Jo
210124 V CAPRICORNI—						
	4622.3	11.0	Bl			
210221 X CAPRICORNI—						
	4622.3	12.0	Bl			
210516 Z CAPRICORNI—						
	4674.8	13.5	Pt			
210812 R EQUULEI—						
	4643.8	12.2	Pt	4673.7	9.4	Wf
	4650.8	11.7	Wf	4674.8	9.1	Pt
	4666.8	10.6	Wf			
210868 T CEPHEI—						
	4595.5	9.1	Ch	4648.7	7.4	Jo
	4614.4	8.5	Ch	4654.5	7.7	Kb
	4616.6	7.7	L	4658.5	7.1	L
	4627.4	8.3	Ch	4667.6	7.6	Kb
	4637.7	7.2	Jo	4670.6	7.5	Kb
	4638.5	7.9	Kb	4670.7	7.3	Jo
	4643.7	7.1	Jo	4674.8	6.7	Pt
	4643.8	7.1	Pt	4676.6	6.9	Kb
	4645.3	8.0	Ch	4676.6	6.8	Jo
	4647.7	8.0	Gb	4681.6	7.2	Kb
	4648.5	7.8	Kb	4682.8	6.8	Gb
210903 RR AQUARII—						
	4643.8	11.8	Pt			
211614 X PEGASI—						
	4643.8	12.2	Pt	4674.8	14.2	Wf
	4650.8	13.8	Wf	4674.8	14.0	Pt
	4670.8	14.2	Wf			
211615 T CAPRICORNI—						
	4622.3	13.0	Bl			

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1926—Continued

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
212030 S MICROSCOPII—						
	4622.3	9.9	Bl			
212814 Y CAPRICORNI—						
	4622.3	[12.6	Bl			
213244 W CYGNI—						
	4590.3	6.1	Kd	4622.3	6.3	Kd
	4598.3	6.1	Kd			
213678 S CEPHEI—						
	4643.8	8.2	Pt	4674.8	8.0	Pt
213753 RU CYGNI—						
	4643.8	8.0	Pt	4678.8	8.2	Pt
213843 SS CYGNI—						
	4595.5	9.0	Ch	4658.5	9.6	L
	4596.5	9.5	Ch	4658.9	10.0	Pt
	4598.4	10.2	Ch	4663.6	10.8	L
	4599.4	10.8	Ch	4663.7	11.5	Wf
	4601.4	11.7	Ch	4665.7	11.6	Pt
	4610.5	11.9	L	4666.5	11.5	L
	4611.6	11.9	L	4666.7	11.6	Wf
	4614.4	11.9	Ch	4666.7	11.5	Pt
	4616.6	11.8	L	4668.7	11.8	Pt
	4618.8	11.8	Wf	4668.7	11.8	Wf
	4619.9	11.8	Wf	4670.6	11.6	Cu
	4620.4	12.0	Ch	4670.7	11.7	Pt
	4620.6	11.5	L	4670.8	11.7	Wf
	4621.6	11.5	L	4672.7	11.6	Wf
	4622.8	12.0	Wf	4672.7	11.8	Pt
	4623.4	11.9	Ch	4673.7	11.8	Pt
	4627.4	12.0	Ch	4673.7	11.6	Wf
	4628.7	11.4	Wf	4674.8	11.6	Wf
	4634.6	11.6	L	4674.8	11.8	Pt
	4637.8	11.8	Pt	4675.7	11.7	Ie
	4640.7	11.8	Pt	4675.8	11.9	Pt
	4640.8	11.6	Cy	4676.7	11.5	Cu
	4642.7	11.6	Cy	4676.7	11.8	Pt
	4642.8	11.5	Pt	4677.5	11.1	O
	4642.4	11.7	Ch	4677.6	11.8	Pt
	4643.4	10.3	Kl	4678.6	12.0	Cl
	4643.8	10.2	Pt	4678.8	11.8	Jo
	4644.4	9.6	Ch	4679.7	11.6	Pt
	4644.8	9.5	Pt	4680.7	11.7	Ie
	4645.4	9.4	Kl	4683.6	11.7	Ie
	4645.4	8.4	L	4683.7	11.6	Jo
	4646.4	9.0	Kl	4683.7	11.6	Cu
	4646.9	9.1	Pt	4683.7	11.6	Pt
	4647.3	8.3	Ch	4684.6	11.7	Pt
	4647.4	8.3	Kl	4685.6	12.0	Cu
	4647.8	8.8	Pt	4686.7	11.9	Ie
	4648.7	8.7	Wf	4686.8	11.8	Jo
	4650.7	9.0	Pt	4686.8	11.5	Cu
	4650.7	8.8	Wf	4687.7	11.6	Cu
	4651.3	8.3	Ch	4688.6	11.4	Cu
	4652.2	8.3	Ch	4691.7	11.9	Cu
	4652.7	8.3	Pt	4692.6	[10.9	Cu
	4656.4	8.8	L			
213937 RV CYGNI—						
	4674.8	6.4	Pt	4687.7	7.7	Cu
	4676.7	7.8	Cu	4688.6	7.2	Cu
	4685.6	7.5	Cu	4691.7	7.2	Cu
	4686.6	7.5	Cu			
214024 RR PEGASI—						
	4643.8	13.4	Pt	4673.7	10.2	Wf
	4650.8	13.2	Wf	4674.8	9.7	Pt
	4666.8	10.9	Wf			
214247 R GRUIS—						
	4622.3	12.7	Bl			
215605 V PEGASI—						
	4646.9	13.0	Pt			
215717 U AQUARII—						
	4646.9	11.9	Pt	4674.8	12.2	Pt
215934 RT PEGASI—						
	4646.9	11.4	Pt	4674.8	10.1	Pt
220133a RY PEGASI—						
	4674.8	8.5	Pt			
220133b RZ PEGASI—						
	4646.9	8.3	Pt	4674.8	8.5	Pt
220412 T PEGASI—						
	4644.2	9.4	Ch			
220613 Y PEGASI—						
	4647.8	12.5	Pt			
220714 RS PEGASI—						
	4647.8	13.0	Pt			
222439 S LACERTAE—						
	4647.8	8.2	Pt	4674.8	9.7	Pt
222867 R INDI—						
	4581.9	[13.0	Bl	4621.9	[12.0	Bl
223841 R LACERTAE—						
	4686.8	9.1	Jo			
225914 RW PEGASI—						
	4647.8	9.4	Pt	4674.8	11.2	Pt
230110 R PEGASI—						
	4644.2	8.2	Ch	4670.8	8.6	Wf
	4647.8	8.1	Pt	4674.8	8.8	Wf
	4663.8	8.5	Wf	4674.8	9.0	Pt
230759 V CASSIOPEIAE—						
	4647.8	8.7	Pt	4674.8	7.3	Pt
231508 S PEGASI—						
	4647.8	13.0	Pt	4674.8	12.8	Pt
231878 RY CEPHEI—						
	4627.4	[9.5	Ch			
232848 Z ANDROMEDAE—						
	4647.8	10.0	Pt	4674.8	10.0	Pt
233335 ST ANDROMEDAE—						
	4642.4	10.7	Ch	4674.8	10.2	Pt
	4647.8	9.8	Pt			
233956 Z CASSIOPEIAE—						
	4589.6	12.1	Cy	4666.8	14.2	Wf
	4618.8	13.8	Wf	4670.8	14.4	Wf
	4650.8	14.3	Wf			
235209 V CETI—						
	4622.3	[11.7	Bl			
235265 R TUCANAE—						
	4576.3	10.4	En	4585.3	10.6	Sm
	4578.2	10.3	En	4589.2	9.9	En
	4583.2	10.0	En	4592.3	10.8	Sm
235350 R CASSIOPEIAE—						
	4683.8	7.5	Jo	4686.7	6.0	Jo
235525 Z PEGASI—						
	4647.8	13.1	Pt	4674.8	12.5	Pt
235939 SV ANDROMEDAE—						
	4647.8	12.6	Pt	4674.8	13.3	Pt

Total observations, 3717; stars observed, 376; total observers, 39.

The following members have contributed to this double report: Miss Alderton, "At"; Baldwin, "Bl"; Bancroft, "Ba"; Benini, "Be"; Berman, "Bi"; Bouton, "B"; Bunch, "Bh"; Campbell, "C"; Chandra, "Ch"; Chisolm, "Cm"; Cilley, "Cy"; Clement, "Cl"; Miss Clough, "Cg"; Miss Cunningham, "Ci"; Cunningham, "Cu"; Elmer, "Em"; Ensore, "En"; Gaebler, "Gb"; Miss Groce, "Gr"; Miss Hawes, "Hs"; Henry, "Hy"; Houghton, "Ht"; Iedema, "Ie"; Johnstone, "Jn"; Jones, "Jo"; Kanda, "Kd"; Koelbloed, "Kb"; Kohl, "Kl"; Lacchini, "L"; Mrs. Leavens, "Ls"; Leavenworth, "Lv"; Olcott, "O"; Peltier, "Pt"; Petrie, "Pj"; Proctor, "Pc"; Rhorer, "Rh"; Smith, "Sm"; Waterfield, "Wf"; Watson, "Pw".

LEON CAMPBELL, Recording Secretary.

July 9, 1926.

GENERAL NOTES

Editorial.—There perhaps has never been a time when the general interest in the subject of astronomy has been as great as it is at present. Important and far reaching developments in related sciences are calling for experimentation for which the stars are the laboratory. Earlier facts and new discoveries in astronomy are being discussed so widely that information which formerly was largely restricted to observatories is now rapidly becoming the possession of all intelligent people.

To assume the responsibility of directing the policy of this magazine under these conditions is a large undertaking. Therefore, it is very reassuring and a source of much gratification to receive, as have already been received from many professional and amateur astronomers and also laymen, expressions of appreciation and of hope for the continued usefulness of POPULAR ASTRONOMY.

As in the past, the function of this journal will be considered to be that of enabling its readers to keep abreast with the progress of the natural sciences, and to give them pleasure in doing so. In order to put its material within reach of everyone, troublesome technicalities will be omitted whenever it is possible to do so without sacrificing accuracy.

For the accomplishment of this purpose the continued coöperation of all students of science is coveted and earnestly solicited, with the hope that such coöperation may be thoroughly merited.

Professor H. C. Wilson is spending a part of this summer at a cottage on the shore of Turtle Lake, near Bemidji, Minnesota. In the latter part of August he, with his daughter Mrs. W. H. Geer and his grandson Richard Geer, will leave for California. They will spend the winter with Professor Wilson's sister, Mrs. Ashton, in Los Angeles. In the spring he will probably return to his home in Northfield, Minnesota.

Professor Edward A. Fath, Director of Goodsell Observatory, left Northfield on July 26 with his family for a motoring trip through the East. Professor Fath will visit a number of observatories and will attend the summer meeting of the American Astronomical Society at Nantucket, Massachusetts. He

will return to Northfield in time to take up the regular work of the college year in September.

Crown Prince Gustavus Adolphus, of Sweden, famous in scientific circles for his work in archaeology, was honored by the University of Chicago. At a special convocation, the degree of Doctor of Laws was conferred on the royal scientist. (*The Science News-Letter,* July 10, 1926.)

Dr. Oliver J. Lee, who for a number of years has been a member of the staff of the Yerkes Observatory, has recently resigned from this position, the resignation becoming effective on August 1.

Sir Frank Watson Dyson, Astronomer Royal of England, at the April meeting of the National Academy of Sciences, was elected a Foreign Associate of the Academy, and the Henry Draper Medal was awarded to Dr. Harlow Shapley, Director of the Harvard College Observatory, for distinguished contributions to astrophysics. (*Astronomical Society of the Pacific,* June, 1926.)

Professor Richard H. Tucker.—After thirty-three years of service, Dr. Richard Hawley Tucker retires as astronomer in the Lick Observatory, at the close of this academic year. During this period three years on leave of absence, 1908 to 1911, were occupied with the construction and the work of the San Luis Observatory of the Carnegie Institution. Over eighty thousand meridian observations were made at San Luis by the staff of ten men, with Professor Tucker as head, a record without precedent in meridian work, for a similar period. The reductions are being completed at the Dudley Observatory, the project having been planned by the late Lewis Boss, and the equipment having been taken from that observatory, to which it was returned.

Four of the fifteen volumes of the Lick Observatory Publications have been devoted entirely to the meridian circle work. With the observation of the stars for *Eros,* made during the past winter, close to fifty thousand meridian observations have been made at Lick, by the retiring astronomer.

During his term of service Prof. Tucker has been in charge at Lick, during absences of the Director, for periods which approximate a total of two years.

With his family he will live at Palo Alto, Calif., for the immediate future, where research work may still be done.

The astronomers at Lick have held the title of Full Professor in the University of California.

Captain Edwin T. Pollock, U. S. Navy, Superintendent of the United States Naval Observatory, had conferred on him the honorary degree of Doctor of Science at the 76th Commencement of Wittenberg College on June 10.

In presenting him Dr. Paul F. Bloomhardt said:

"Upon the recommendation of the Faculty I have the honor to present for the Degree of Doctor of Science, Edwin Taylor Pollock, Captain in the United States Navy; graduate with credit from the United States Naval Academy and later instructor in the institution; graduate of the United States Naval War College; honored by our nation for distinguished services in two wars; equally worthy of honor for scientific achievements in peace; commander of the U. S. S. *Salem* in 1913 on her trip to Gibraltar for extensive radio tests; representative of his nation

in receiving the sovereignty of the Danish West Indies and their first American governor; promoter of progress by the building of highways while governor of American Samoa; former Assistant Superintendent and now Superintendent of the United States Naval Observatory upon whose work of exact time fixation a large part of our industry on land and commerce at sea depends; commander of the group of scientists who studied the solar eclipse in January, 1925, from the dirigible *Los Angeles;* Captain Pollock, navigator of the High Seas, builder of Highways, and observer of the High Heavens."

Tycho Brahe's Observatory.—The Royal Academy of Sweden has appointed a committee to organize a celebration of the 350th anniversary of the foundation of Tycho Brahe's Observatory, Uraniborg, on the island of Huen, which now belongs to Sweden. (*Bulletin of the Am. Math. Soc.*, May-June, 1926.)

Cresson Medals of the Franklin Institute were presented to Dr. George Ellery Hale, honorary director of the Mount Wilson Observatory, and to Dr. Charles Sheldon Hastings, professor emeritus of physics, Yale University, at a special meeting of the Institute on May 12. (*Astronomical Society of the Pacific*, June, 1926.)

The Russian Refracting Telescope.—Supplementary to and to a certain degree corrective to a note on this subject in the May (1926) issue of POPULAR ASTRONOMY we give this information, received in a private letter. The failure there referred to merely means that the disks so far cast have failed to pass optical tests, but others are now being cast. Messrs. Grubb and Parsons, the makers, insist on great optical perfection before delivering the lenses. Moreover, this firm is willing to undertake the making of an object glass in excess of thirty inches in diameter.

"Incidentally Sir Charles Parsons (also of turbine fame) told me that at his optical glass works, he was prepared to accept orders for objective disks of any size. I murmured 'even 6-feet' and he nodded assent."

The process of casting the glass for such large lenses is at present not being made public.

Sydney Observatory.—For reasons of economy the Government of New South Wales has practically abolished Sydney Observatory. Mr. W. E. Cooke, who has been the Director for many years, retires on account of age at the end of August, 1926. Mr. Raymond, Chief Assistant, will be the only official who will remain at the Observatory, all the other members of the staff being transferred to other departments of the government. Mr. J. Nangle, Superintendent of Technical Education, will hereafter be in charge, but it is understood that all research now ceases.

Eclipse of the Sun, July 9, 1926.—The annular eclipse of the sun on July 9, whose path lay across the Pacific Ocean from a point between Australia and Japan to a point south of Mexico, passed practically without comment. An annular eclipse at best does not elicit nearly the interest which is always created by the approch of a total eclipse. This one had the added disadvantage of failing to cross any land areas. It, however, came rather near the Hawaiian Islands,

and through the courtesy of the *Science News Service* we have a letter from a high school boy in Makawao, Maui, from which we quote a few sentences.

"I am thinking, perhaps, you would like to know something about the eclipse here at Hawaii which started this morning, changing the color of the sunlight. The first sight of the shadow commenced at $11^h\ 07^m\ 45^s$ A.M. Pacific Standard Time at Maui, Hawaiian Islands, and faded away and the sun heated the earth again with its full strength at $3^h\ 55^m\ 56^s$ P.M. The highest point was at $1^h\ 58^m\ 11^s$ at which time a star was observed.

"The star which we observed was found in the western sky. It was very clear to our unaided eyes.

"The extent of the shadow was more than 80 percent. With crude instruments, made by myself, at maximum the shadow was determined to be 87.4 percent. I can not vouch for the percentage for it was calculated by crude instruments.

THOMAS A. FUJABOYOSHI.

Box 115, Makawao, Maui, Hawaii, July 9, 1926."

Germany Admitted to the International Research Council.—The scientists of the Germanic countries, enemies of the Allies during the war, have been invited to sit in the councils of international science. The International Research Council has by unanimous vote of the twenty countries attending the recent meeting in Brussels invited Germany, Hungary, Austria and Bulgaria to join the council. This action will bring all of the principal nations into the circle of international science and end the exclusion hitherto suffered by enemies of the allied nations. The matter of changes in the basis of dues of the various countries in the council was left for later decision by the various international unions affiliated with the International Research Council and the Council's officers. Dr. Vernon Kellogg, permanent secretary of the American National Research Council, Dr. F. G. Cottrell, director, Nitrogen Fixation Laboratory, and Prof. George Birkhoff of Harvard University represented America at the meeting and supported the resolutions admitting Germany.

The action of the International Research Council admitting the Central European Powers to its membership brings to fruition the effort of protagonists for international scientific amity to consolidate the relationships of the international scientific world. The International Research Council was organized during the world war by representatives of the Allied and neutral nations and at that time membership of the enemy countries was out of the question. Since, however, the International Research Council replaced the older international organizations that were disrupted by the outbreak of the war, a strong sentiment grew up for the admission of the former enemy countries just as soon as the war feelings died away. Last year the American delegation supported by England, Sweden, Denmark, Norway, and Holland, urged the admission of the former enemy organizations, but although those nations were in the majority, a minority, represented chiefly by France, Belgium, Czecho-Slovakia and Poland, together with the rules of voting, prevented the admission of Germany, which has now been accomplished. (*The Science News-Letter*, July 17, 1926.)

Interior of Stars Studies.—Recent advances in atomic physics have led to a great increase in the understanding of internal conditions in the stars, Dr. Henry Norris Russell, of Princeton, told the National Academy of Sciences at its recent meeting.

"The outstanding problem is to find out where the heat radiated by the stars comes from and in what manner heat is liberated inside the stars," said Dr. Russell. "We now know that inside a star the atoms have their outer parts knocked off, but retain their individuality. And it is possible to calculate at what rate heat should escape from the interior to the surface, and therefore how bright the stars should be, if we know how large and massive a star is and how much denser it is in the interior than at the surface."

Existing evidence, indicates that heat is probably produced by a slow transformation of matter into energy, after the manner first suggested by Einstein, Dr. Russell declared. If all stars were composed of exactly the same material, stars of the same mass would be similar, not only in brightness, but also in size, color, and temperature. This is not a fact, and it follows that some stars must contain more than others of the "active material" which is the source of heat.

"The life history of a star depends upon the proportion of active material in its composition," said Dr. Russell. "If, as seems probable, this originally forms the larger part of the star's mass, a star of large mass will start as a red giant, gradually become hotter and whiter, and finally cool down and end as a faint dwarf. Stars of smaller mass may begin their careers as dwarf stars without ever passing through the giant stage." (*Science News-Letter*, May 8, 1926.)

The Spiral M 33 as a Stellar System is the subject of an extended study by Dr. Edwin Hubble in the *Astrophysical Journal* for May, 1926. This object, designated also N. G. C. 598, in position $1^h\,28^m\,12^s$, $+30°\,8'.6$ (1900.0), is referred to as the fainter of the two naked-eye spirals. The conclusions reached are interesting and are given here as they appear in the *Astrophysical Journal*.

"The present investigations indicate that Messier 33 is an extremely distant system of stars and nebulae, similar in many respects to the Magellanic Clouds. It differs, however, in two important characteristics: The great majority at least of the brightest stars are of early spectral types, and there is a symmetrical arrangement of material with respect to a dominating nucleus. Detailed study of the stars within the limits of observation—the three or four brightest magnitudes—indicates that they are normal giants such as are known in other systems. The application of all available criteria leads to this one interpretation of the data.

"The distance, derived from the period-luminosity relation applied to thirty-five apparently normal Cepheids, is about 8.1 times that of the small Magellanic Cloud, or, using Shapley's distance for the latter, about 263,000 parsecs. The order of this distance is confirmed by evidence from independent sources—novae, emission nebulosity with blue stars involved, and the luminosity function. The distance being known, the apparent dimensions of the spiral can be converted into absolute dimensions, assuming the form, from analogy with other spirals, to be lenticular, with a minor axis about one-tenth of the major axis. . . . .

"It is evident that Messier 33 must be considered as comparable in size with the Clouds rather than with the galactic system. It is not, however, of an entirely different order from the latter, and, in this connection, it may be mentioned that in size the other great spiral, Messier 31, occupies an intermediate position. Including the Magellanic Clouds, which are most readily interpreted as irregular non-galactic nebulae, five systems are now known which are believed to be distinct from the galactic system. The diameters range from 1250 parsecs for N. G. C. 6822 to about 14,000 parsecs for Messier 31. The ratio is about 1 to 11. The multiplication of the dimensions of Messier 31 in the same ratio would include the galactic system, even as outlined by the globular clusters."

On the possibility of observations of the Zodiacal Light during the total eclipses of the Sun.—The discussion of this subject recently made in the Astrophysical Institution, Moscow, has led to the following results. The brightness of the sky in the proximity of the eclipsed sun is due mainly to the scattering of the second and higher orders of light coming from outside of the moon's shadow. In some measure the sky is illuminated by the scattering of the light of the corona and other envelopes of the sun not covered by the moon as well as by scattering chiefly of the first order of the upper strata of our atmosphere which are on the way of the rays of sight inclined to the axis of the moon's shadow.

For the purpose of fixing the conditions favorable to observations of the Zodiacal Light, the most simple case, namely when the sun is in the zenith and clouds are totally absent, was considered. The table given below represents the theoretical brightness of the sky near zenith expressed in the number of stars of fifth magnitude per one square degree, ξ_0 being the radius of the moon's shadow, p being the coefficient of transparency of the atmosphere.

$\xi_0 \backslash p$	0.852	0.830	0.787
35	985	1157	1378
50	653	712	751
75	331	317	264
100	165	139	96
150	42	32	25

The solar corona furnishes under the same conditions some 25 to 35 stars of fifth magnitude per one square degree.

As the possible brightness of the Zodiacal Light near the sun is, as it may be expected, some 100 to 200 in the same units, we see that the observations similar to those made by Kunz and Stebbins in 1918 and 1925 are of value for the investigation of the Zodiacal Light only if $\xi_0 > 100$ km. It is to be remarked that the greatest possible ξ_0 is equal to 134 km. The whole discussion of the subject may be found in *Russian Astronomical Journal* Vol. 3, part 3.

B. Fessenkoff.

Astrophyiscal Institution, Moscow.

The Thirty-Sixth Meeting of the American Astronomical Society will be held at the Maria Mitchell Observatory, Nantucket, Massachusetts, from September 7 to 10, 1926. For those who are planning to attend these meetings, the following items of information, taken from a circular issued by the Secretary on June 10, will be of interest.

Nantucket is reached by boat from New Bedford and Woods Hole, Massachusetts. There are two boats to and from the Island each day. From Boston trains leave at approximately 7:00 A.M. and 1:00 P.M. (daylight saving time) on the New York, New Haven, and Hartford Railroad, and connect with the Nantucket boats at Woods Hole. These boats are due in Nantucket at 1:15 and 7:15 P.M. (daylight saving time). From New York the easiest way is to take the evening boat on the New Bedford Line of the New England Steamship Company to New Bedford, where there is an easy change to the Nantucket boat which sails from the adjoining wharf and reaches Nantucket at 1:15 P.M. Another way is by boat on the Fall River Line, thence by bus to New Bedford. The shortest route by rail from New York is via Providence, train or bus to New Bedford wharf. The journey from New Bedford to Nantucket takes about five hours; from Woods Hole to Nantucket, three hours. Taxis and baggage trucks meet all boats.

Tickets can be bought through to Nantucket from almost anywhere, and

baggage checked right through. Round trip tickets are a little cheaper. At the present writing, the best plan for a western member would be to purchase a fifteen-day round trip ticket to New York, good via the Sesquicentennial Exposition at Philadelphia, and then take the steamers from New York to Nantucket and return. As the travel of the summer visitors from the islands is heavy throughout September, persons desiring to return to New York via the New Bedford or Fall River Line boats should get their reservations well in advance.

Automobiles may be taken to Nantucket, but reservations on the boat to and from the Island must usually be made in advance. It is very doubtful whether members will find it worth while to take their cars to the Island.

The Ocean House, an excellent first-class hotel on the American plan, will be the hotel headquarters during the meetings. Rates for members and friends of the American Astronomical Society will be $5.00 per person per day, including meals, for two persons in a room with twin beds and running water. For one in a similar room, or for two in a room with bath, the rate will be $6.00 per person. Reservations should be made in advance by writing directly to the Ocean House, Nantucket, Massachusetts. The Ocean House is centrally located in the town of Nantucket on Broad Street. It is only a few hundred yards from the steamboat wharf.

For persons desiring more reasonable rates, a limited number of rooms in private houses can probably be procured for $2.00 per day, room only, if Miss Harwood is notified before August 20. There are numerous restaurants and tea houses near.

Mail should be addressed care of the Ocean House, or care of Maria Mitchell Observatory, Nantucket, Massachusetts.

Being an island, forty miles from the mainland, Nantucket is never hot, and it may be damp; moreover, Nantucket is never dressy. Visitors are advised to bring ordinary summer clothing with a coat or sweater, no evening dress, but a bathing suit.

The Nantucket Maria Mitchell Association invites the members of the American Astronomical Society and their friends to tea directly after the afternoon meeting on Wednesday, September 8. There will then be an opportunity to see the Observatory and the Memorial House which was the birthplace of Maria Mitchell.

The automobile drive about the Island on Thursday will be designed to give the visitors an idea of the scenery: shores, outlying villages, and general topography of the island. The cost will be slight. There are interesting walks, drives with horses, and horseback rides. A most interesting whaling collection in the Historical Society, the oldest house, the Friend's Meeting House, and the Old Mill are a few of the many things worth seeing on the Island. Courts will doubtless be obtainable at the Yacht Club for tennis players, and there are two fine golf courses on the Island, besides still-water bathing on the north shore and surf bathing on the south and east shores. The afternoon sail to Wauwinet on Friday will be planned so that all who wish can have a swim and a shore dinner. The cost of the sail to Wauwinet will be fifty cents.

The special dinner will be held on the "Skipper," a very attractive tea house on and near an old sailing vessel. The cost will be two dollars per plate.

A committee of Nantucket ladies will form an information bureau for the benefit of the visiting ladies who prefer recreation to scientific meetings.

The Maria Mitchell Observatory is situated on Vestal Street and is within easy walking distance from the Ocean House. The scientific meetings will be held in the Library of the Maria Mitchell Association, across the street from the Observatory.

PROGRAM (Subject to change).

Tuesday, September 7, 1926—

Evening: Informal gathering at the Ocean House.
8:00 P.M. Meeting of the Council at the Observatory.

Wednesday, September 8—

9:00 A.M. Opening meeting and session for papers.
11:00 A.M. Adjourn to the Bathing Beach.
2:00 P.M. Session for papers.
4:30 P.M. Tea at the Observatory.
8:00 P.M. Public lecture.

Thursday, September 9—

8:00 A.M.	Meeting of the Council.
9:00 A.M.	Session for papers.
11:00 A.M.	Adjourn for a swim and lunch.
2:00 P.M.	Session for papers.
3:30 P.M.	Drive around the Island by automobiles.
7:00 P.M.	Special dinner at the "Skipper."

Friday, September 10—

8:00 A.M.	Meeting of the Council.
9:00 A.M.	Final session for papers.
	Election of officers.
2:00 P.M.	Sail up the harbor to Wauwinet.

World Longitude Determination.—The plan for world-wide longitude determinations, announced here, affords an opportunity which many observatories will wish to avail themselves of. Memoranda have been given out by the U. S. Naval Observatory as follows:

1. There will be a World Longitude Determination by radio signals, beginning October 1, 1926, and ending December 1, 1926. This project proposed several years ago has the approval of the International Astronomical Union and of the International Geodetic and Geophysical Union.

2. The principal stations of the so-called "fundamental polygon" will be at the Naval Operating Base, San Diego, Calif., at the Algiers Observatory, and at the Shanghai Observatory. These stations are at nearly the same latitude, and are spaced approximately 8 hours apart in longitude. It is proposed to determine the differences of longitude with great accuracy, and to make re-determinations at intervals sufficiently separated in time in order to test the permanency of their relative positions, and certain possibilities as to movement of the earth's crust.

3. It is expected that many other observatories will join in this operation, including Washington, Greenwich, Paris, and Australasian observatories. The U. S. Coast and Geodetic Survey proposes to occupy stations at Honolulu and Manila.

4. The radio signals will be of the so-called rhythmic type, so spaced that there will be 61 signals per minute for 5 minutes, 306 in all. They will be sent at 3 periods of the day, as follows, Greenwich Time:

		h m		h m
Annapolis	17145 meters	20:10	to	20:15
		3:10		3:15
		10:10		10:15
Arlington or Bellevue (near Washington)	74.7 and 24.9 meters	20:20		20:25
		3:20		3:25
		10:20		10:25
Honolulu	11500 meters	20:30		20:35
		3:30		3:35
		10:30		10:35
Honolulu	36.8 meters	20:40		20:45
		3:40		3:45
		10:40		10:45
Saigon	17000 and 25 meters	11:30		11:35
		19:00		19:05
Bordeaux	18900 meters	8:01		8:06
d'Issy (near Paris)	32 meters	20:01		20:06
		8:01		8:06

5. It is suggested and urged that as many astronomical observatories as can arrange to do so make time observations, and receive the signals thus enabling

them to establish their longitudes with reference to one or more of these points of reference. The radio signals may be received automatically on a chronograph, a method which has some obvious advantages, or by ear by the coincidence or other methods. Short wave signals are sent as well as long wave signals, as some observers report better reception by the short waves especially at very distant stations, when there is not much daylight between the stations.

6. The Annapolis and Arlington (or Bellevue) signals will be the principal ones by which observers in this country can connect directly with Washington. These signals will also probably give a direct connection with Greenwich and Paris, as will also the Bordeaux signals.

7. The International Astronomical Union recommends that in the reductions the star places of the *American Ephemeris* be used as far as possible and that clock stars be confined to the region 20° or 25° north and south of the zenith.

8. Any inquiries regarding the work will be gladly answered by the U. S. Naval Observatory, Washington, D. C.

Sun to Shine 15 Trillion Years.—The interior of the sun must have a temperature of 70,000,000 degrees Fahrenheit, at the center, which gradually decreases until it is only about 10,000 degrees at the surface. That this is necessary to keep the sun at the size it is at present, and to prevent the gravitating mass of the outer part from collapsing to the center, is the opinion of Prof. A. S. Eddington, professor of astronomy at Cambridge University, stated in a series of lectures at King's College, of the University of London.

As a result of this conclusion, says Prof. Eddington, "no source of energy is of any avail unless it liberates heat in the deep interior of a star." This, he believes, effectually disposes of an idea, suggested in the past, that the sun received its energy from meteors which fell into it from outer space. "Clearly," he states, "you cannot maintain a temperature gradient by supplying heat at the bottom end. If this year the sun encountered a swarm of meteors which bombarded it with enough energy to furnish a year's supply of radiation, that would not add a year, or even a day to the life of the sun; its internal readjustments would go on unaffected. All that would happen would be that the sun would give us twice the normal amount of radiation this year."

The theory once proposed that the sun is gradually contracting, and so releases the energy which forms the heat, is also untenable, says the astronomer, because with such a theory the sun cannot be more than 46,000,000 years old. "Physical and geological evidence seems to be conclusive," he says, "that the age of the earth—reckoned from a period which by no means goes back to its beginnings as a planet—is much greater. The age of the older rocks found from their uranium-lead ratio is generally put at 1,200,000,000 years; lower estimates have been urged by Prof. Joly, but none low enough to save the contraction hypothesis."

Astronomical facts also support these ideas of the age of the solar system, and so, says Prof. Eddington, "we seem to require a time-scale which will allow at least 10,000,000,000 years for the age of the sun; certainly we cannot abate our demands below 1,000,000,000 years."

"Since we cannot very well imagine an extraneous source of heat able to release itself at the center of the star, the idea of a star picking up its energy as it goes along seems to be definitely ruled out. It follows that the star contains hidden within it the energy which has to last the rest of its life. But energy cannot be successfully hidden; it betrays itself because it has (or because it is) mass. How

much of the sum total of the energy of the sun is capable of being converted into radiation we do not know; but if it is all available, there is enough to maintain the sun's radiation at the present rate for 15,000,000,000,000 years. To put the argument in another form, the heat emitted by the sun each year has a mass of 120,000,000,000,000 tons; and if this loss of mass continued there would be no mass left at the end of 15,000,000,000,000 years."

Since all the other alternatives are eliminated, Prof. Eddington supposes that the source of the energy must be in the protons and electrons, charges of positive and negative electricity, of which the atoms are composed.

"We have to suppose," he says, "that a proton and electron run together, their electric charges cancel and nothing is left but a splash in the ether which spreads out as an electromagnetic wave carrying off the energy."

He admits the difficulty of some of these ideas, for apparently at a temperature of 70,000,000 degrees the energy is liberated so copiously that he asks, "can we suppose that energy issues freely from matter at 70,000,000 degrees as steam issues from water at 212 degrees? I think that physicists would be hard put to it to reconcile such extraordinary behavior with any accepted principles, yet that is what the astronomical observations taken at face value seem to insist."

In a reply to this suggestion, Prof. J. H. Jeans, president of the Royal Astronomical Society, denies that this can happen, for, he says, the transformation of matter to energy itself is a process which liberates more heat, and, "as soon as the center of a star reached 70,000,000 degrees, the heat generated would raise the neighboring parts to 70,000,000 degrees, these would generate more heat, and so on, the high temperature spreading explosively throughout the star. The true analogy would be, not the issue of steam from water, but the explosion of a magazine of gunpowder." (*The Science News-Letter*, June 26, 1926.)

BOOK REVIEWS

Elements of Astronomy, by EDWARD A. FATH (McGraw-Hill Book Co.).

Often a teacher is puzzled to find a reason for the appearance of a new textbook. In this case, however, there has been a demand which has been informally voiced at every gathering of astronomers in the last few years, for a text which will present in elementary form to beginners a synopsis of the tremendous advances of the last dozen years in stellar physics. Dr. Fath has succeeded admirably in meeting this need.

It is impossible for any text to satisfy all teachers at every point. Objections to the order in which material is presented can be only personal opinions. The reviewer would offer serious criticism on only one point of arrangement. In the second chapter the law of gravitation is applied to the determination of the mass of the earth, of its shape, and of the different kinds of latitude. However, the law itself is not presented formally until the eighth chapter, which bears it as a title. It would seem better to present the law, discuss its all-inclusiveness, and then follow immediately with the various applications to astronomy regardless of their spatial distribution. This the text does in part in chapter VIII.

The freedom from serious errors is quite a striking point in this book as contrasted to most first editions. The reviewer looked up several points where he thought small errors existed and in almost every case found the text correct.

In respect to the rotation periods of Uranus and Neptune the author might well have referred to Kaul's paper published in the *Physikalische Zeitschrift* in

1922 and discussed by Lundmark in Vol. 34 of the *Publications of the Astronomical Society of the Pacific*.

In all controversial points the author inclines to the conservative side, though often with a good explanation of the more radical views. Regardless of individual viewpoints, it seems that this is the proper position to take in any introductory book.

The general appearance of the book is excellent. There are many good illustrations, but the addition of a number of special full-page plates would have caught the eye of the student advantageously.

The book will be adopted this fall by the reviewer for the briefer of his introductory courses. He believes that the instruction in this course will thereby be materially improved. It does not seem to him adapted to his more rigorous five-hour course through the entire year. This opinion regarding its field coincides exactly with that expressed by the author.

DINSMORE ALTER.

University of Kansas, July 28, 1926.

The Universe of Stars (Eastern Science Supply Company, Box 1414, Boston, Mass., $2.00 postpaid).

This is the title given to a collection of radio talks from the Harvard Observatory. It has the distinction of being the first book of this kind ever published. The collection is divided into four parts. I, the Material and Methods of Astronomy; II, the Solar System; III, The Stars; IV, The Stellar System. Under each of the first two parts there are six separate talks, and under each of the other two, five. These talks were given last winter by various members of the staff of the Harvard Observatory, five of them by the director, Professor Harlow Shapley.

The writer knows of no source of astronomical information equal to this for the average person. Here are found the classical as well as the modern facts of astronomy presented accurately yet simply, scientifically yet non-technically. The authors of the various talks are persons who have spent years in studying the topics discussed by them, and are thoroughly competent to speak about them. The individual talks are brief and complete in themselves. The reader who has ten or fifteen minutes only at a time may take up this book and read one of the talks in that time with pleasure and profit.

In the preface a bibliography of elementary astronomical literature is given which will be found very useful. The "Universe of Stars" may well stand at the head of this list.

Next Issue.—We regret that lack of space makes it necessary to postpone a part of Professor W. H. Pickering's Report on Mars until the next issue. Following the part in this number, Professor Pickering proceeds with a very interesting discussion under the heading "What I believe about Mars." This will appear in the October number which will be mailed about October 1.